NATUR CYMRU
Nature of Wales

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- Hawfinches
- Guillemots
- Reintroductions
- Adar hela
- Molluscs
- Marine worms
- Mynydd Hiraethog

Books, news, comment ...

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NATUR CYMRU CYNNWYS • CONTENTS

Newyddion / News 2

Golygyddol / Editorial • Geoff Gibbs 3

In search of the hawfinch in Meirionydd • Dave Smith ..... 4 - 9
The wooded estates around Dolgellau are especially suited to this secretive bird

Long lives, short memories: guillemots on Skomer since the 1930s • Tim Birkhead ..... 10 - 14
Photographic evidence reveals there was a much larger population than previously thought

Llyn Tegid – the last stronghold of the glutinous snail • Martin Willing ..... 15 - 19
Keeping track of this rare snail in its only known Welsh location

Sharing shells... underwater symbiosis • Andy Mackie and Tim Whitton ..... 20 - 23
The strange relationship between a hermit crab and a marine worm

Adar Hela Cymru yn yr Oesoedd Canol • Howard Williams ..... 24 - 29
Tystiolaeth cerddi'r cyfnod

The hypothetical otter – reintroductions: how would we react? • Rob Parry ..... 30 - 33
If otters had become extinct, would we be keen to reintroduce them?

Mynydd Hiraethog land-use change and biodiversity, 1820 to the present day • John Osley ..... 34 - 39
The changing fortunes of moorland estate in North East Wales

Molluscs as markers in the Living Landscapes of Gwent • Imogen Cavadino and Ben Rowson ..... 40 - 43
Molluscs are generally under-recorded yet can act as indicator species

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NODWEDDION ARFEROL / REGULAR FEATURES

Buglife • Clare Dinham 44
Snug as a bug – where insects and other invertebrates go in winter

Islands round-up • Geoff Gibbs 45
Skokholm, Skomer, Ramsey, Grassholm, Bardsey

Green bookshelf • Andrew Lucas, Ian Rappel, Kate Gibbs ..... 46 - 47

Mammal news • Frances Cattanach ..... 48 - 49
Bangor Symposium, pine martens, beavers, red squirrels, water voles, mammal sightings

OPAL yma o hyd! OPAL still here! • Bob Griffiths ..... 50 - 51
Newyddion o'r Labordai Awyr Agored: News from the Open Air Laboratory

Woods and forests • Rory Francis 52
Protecting our ancient woodland – the need for vigilance

Newyddion Natur Cymru News

Bwrdd Natur Cymru Board

Fel yr adroddwyd yn flaenorol daeth cysylltiad *Natur Cymru* â Chyfoeth Naturiol Cymru i ben ym mis Mehefin 2016 ac fe symudodd Natur Cymru i swyddfa wahanol ar Ynys Môn, drwy garedigrwydd RSPB Cymru. Mae Amgueddfa Genedlaethol Cymru ac Ymddiriedolaeth Genedlaethol Cymru hefyd wedi bod yn gefnogol iawn. Rydym yn ddiolchgar iawn am y cymorth gan y tri chorff hwn.

Diolch i haelioni ein tanysgrifwyr a'n cefnogwyr, rydym wedi llwyddo cyflogi Rheolwr Cynhyrchu/Cyd-olygydd a Swyddog Gweinyddol, ar gytundeb, i Mawrth 2017. Ond rydym yn ddibynnol o hyd ar wirfoddolwyr, yn enwedig o ran golygu, er mwyn cynhyrchu cylchgrawn o ansawdd *Natur Cymru*. Rydym wedi bod yn ymchwilio i ffyrdd o gynnal y cylchgrawn y tu hwnt i fis Mawrth 2017 ond hyd yma nid ydym wedi canfod datrysiad. Byddwn yn parhau gyda'n hymdrechion a byddem yn falch o glywed am unrhyw syniadau gan ein cefnogwyr.

Rydym wedi cytuno bod angen golygydd a swyddog gweinyddol sy'n cael eu talu er mwyn cynnal *Natur Cymru* yn yr hirdymor. Ar hyn o bryd nid yw'n debygol y bydd digon o gyllid gennym i barhau â'r cylchgrawn ar ôl Mawrth 2017. Felly, wrth i ni barhau i chwilio am ffynonellau posib o arian i gyllido'r cylchgrawn rydym wedi cytuno y dylem roi cynllun ar waith i orffen cyhoeddi ar ôl rhifyn Gwanwyn 2017. Efallai y bydd hyn yn gam terfynol a pharhaol ond mi gaiff ei wneud mewn ffordd a fydd yn caniatáu i'r cylchgrawn gael ei atgyfodi yn y dyfodol.

Er mwyn lleihau gwaith gweinyddol a chostau rydym wrthi'n cysylltu gyda thanysgrifwyr drwy ebost lle bynnag y bo hynny'n bosib, felly byddem yn ddiolchgar pe gallech gadw llygad ar eich blychau ebyst yn cynnwys y spam. Os yw eich tanysgrifiad yn barod i'w adnewyddu a wnewch chi adnewyddu am ran o'r flwyddyn yn unig, hyd at Fawrth 2017, os gwelwch yn dda. Os fydd y cylchgrawn yn cael ei atal dros dro byddwn yn defnyddio unrhyw arian a godwyd eleni i barhau gyda'r gwaith o chwilio am ragor o gyllid ac i gynnal mymryn o wasanaeth i werthu hen gopiau ac i weinyddu'r wefan. Mi fyddem wedi dymuno rhannu newyddion mwy positif gyda chi, ond rydymyn diolch i chi am eich cefnogaeth barhaus i *Natur Cymru* ac i amgylchedd naturiol Cymru.

As previously reported, *Natur Cymru* separated from Natural Resources Wales in June 2016 and has relocated to office space provided by RSPB Cymru on Anglesey. The National Museum of Wales and National Trust Wales have also given their support. We greatly appreciate the help from all three organisations.

Thanks to the great generosity of our subscribers and supporters, we have been able to contract the services of a paid Production Manager/Co-Editor and a paid Office Administrator 2016 to March 2017. However, we still rely heavily on volunteer time, particularly in terms of editing, to produce a magazine of the quality of *Natur Cymru*. We have been exploring ways of continuing the magazine beyond March 2017. So far none of our lines of enquiry have come to fruition but we will continue with our efforts, and would welcome any suggestions from our supporters.

We have agreed that in the long term *Natur Cymru* should operate with a paid editor in order to be on a par with the paid administrative roles. At the moment we will not have the financial means to continue after March 2017. Therefore, whilst continuing to explore potential sources of support, we have agreed to put plans in place to cease publication after the Spring 2017 edition. This closure may be permanent but it will also be done in a fashion that would allow the magazine to be resurrected in the future.

In order to minimise expense and administration, we are contacting subscribers by email whenever possible, so we'd be grateful if you'd check your mailboxes and spam folders. If your subscription is due for renewal, we are asking you to renew only for the proportion of the year up to March 2017. If the magazine is temporarily dormant, the donations raised this year will be used to help our search for funding support, and to operate a minimal service for sales of back copies and administering the website. We would have much preferred to be able to give you more positive news at this point but we thank you for your continued support for *Natur Cymru* and the natural environment of Wales.

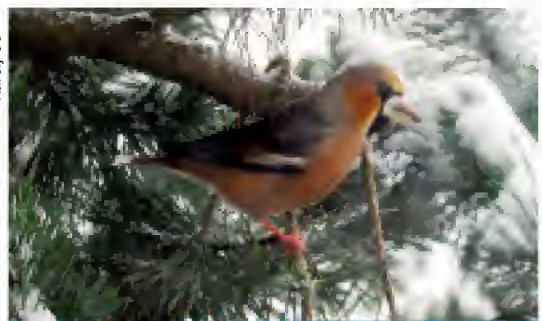
GOLYGYDDOL EDITORIAL

Mae'r rhifyn hwn yn cynnwys nifer o erthyglau am rywogaethau eithaf enigmataidd, yn cynnwys un gan Dave Smith yn disgrifio'i waith astudio manwl ar y gylfinbraff yn ardal Dolgellau, un arall gan Martin Willing yn sôn am y falwen ludiog yn Llyn Tegid ac hefyd erthygl am y defnydd o folysgiaid fel dangosyddion ar wastadeddau Gwent. Ysgrifennwyd yr erthygl olaf hon gan Imogen Cavadino sy'n gweithio dan hyfforddiant gyda'r arbenigwr molysgiaid Ben Rowson yn Amgueddfa Genedlaethol Caerdydd. Efallai nad 'enigmataidd' yw'r disgrifiad gorau o wylogod ar silffoedd creigiog gorlawn ein harfordir, ond mae gwaith Tim Birkhead i ganfod mwy am y newidiadau yn eu poblogaeth ar ynys Sgomer ers y 1930au yn cychwyn gyda rhai o ffotograffau Lockley a dynnwyd pan oeddem yn gwybod llawer llai am yr adar hyn.

Mae Andy Mackie, sydd hefyd yn gweithio yn yr Amgueddfa Genedlaethol, yn disgrifio mwydyn gwrychog morol sy'n byw ochr yn ochr â chranc meddal y tu mewn i gragen gwichiad, ac sy'n dwyn bwyd oddi ar y cranc! Yn yr erthyglau Cymraeg cawn ddysgu mwy gan Howard Williams am y cyfeiriadau at adar ysglyfaethus mewn barddoniaeth o'r canol oesoedd ac mae Bob Griffiths yn disgrifio hynt a helynt prosiect OPAL i hybu gwyddoniaeth y werin yng Nghymru. Mae erthygl John Osley yn disgrifio'r newidiadau mawr mewn defnydd tir ar Fynydd Hiraethog ers y 1820au, a sut y gallai'r rhain effeithio ar fywyd gwyllt pwysig yr ucheldir hwn. Mae niferoedd dyfgrwn yng Nghymru wedi cynyddu ac maen nhw bellach i'w canfod ar y mwyafrif o afonydd. Rob Parry sy'n ystyried yr hyn allai fod wedi digwydd pe bydden nhw wedi mynd i ddifodiant, a'r dadleuon posib o blaid ac yn erbyn ailgyflwyno. Gallai hyn fwrw goleuni ar faterion cadwraethol eraill sy'n peri cur pen i ni ar hyn o bryd.

Geoff Gibbs

This number has several articles about rather enigmatic species, including Dave Smith describing his detailed studies of hawfinches in the Dolgellau area, Martin Willing on the glutinous snail in Llyn Tegid and another on molluscs as indicator species in the Living Landscapes of Gwent. This contribution is from the National Museum in Cardiff, where trainee Imogen Cavadino has been working with mollusc specialist Ben Rowson. It may be straining it a bit to describe guillemots on their crowded ledges as enigmatic, but Tim Birkhead's detective work to quantify their population changes on Skomer since the 1930s starts with some Lockley photographs taken when far less was known about the species.



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Hawfinch *Coccothraustes coccothraustes* Gylfinbraff

Also from the National Museum, Andy Mackie describes a marine bristleworm that lives beside a hermit crab inside an old whelk shell; the worm gets its food by stealing from the crab! Articles in Welsh discuss what can be learnt about birds of prey from medieval poetry (Howard Williams) and the first three years of the OPAL citizen science project, outlined by Bob Griffiths. Mynydd Hiraethog is also known as the Denbigh Moors, and John Osley's article covers major land-use changes since 1820, and how these might affect the important upland wildlife found there. Otters in Wales have recovered from very low numbers and they are now found on most rivers. Rob Parry considers the scenario if extinction had actually occurred, and the possible arguments for and against reintroduction. This could provide insights into other current conservation dilemmas.

Geoff Gibbs

In search of the hawfinch in Meirionnydd

Bel Andre rspb-images.com

Hawfinch *Coccothraustes coccothraustes* Gylfinbraff

The hawfinch is a species most birdwatchers know little about. They will at least know that they are rapidly declining in Britain, are very secretive and difficult to find at most times of year, and, last but not least, they can crack cherry stones in that enormous beak. ***DAVE SMITH*** *describes his personal odyssey to discover more about them in the Dolgellau area.*

Each Autumn the call would come in to the RSPB Mawddach Reserve Office. "The berries are on the trees..." was spoken in hushed tones to the Site Warden, who quietly acknowledged the tip-off in discreet and knowing anticipation. It was quality birding intelligence, distributed amongst a select few North Walian birders, all of whom were looking to connect with one of our most secretive, striking and sought after birds, the hawfinch. Once I had deciphered the significance and meaning of this information trail... hawfinches, yew trees, churchyards, red berries... I decided to mount a rather more local investigation of my own to search for this bird which had already succeeded in capturing my imagination. Following similar leads to those pursued elsewhere, I visited the local church, only two miles down the road from the Reserve, on an uncertain pilgrimage. Remarkably, the very first search produced a handsome male hawfinch, catching the sunlight as it sat high in the crown of one of the ancient and profusely fruiting yew trees in the churchyard. I was captivated, and so began something of an ornithological odyssey, one which continues to enthral and enchant to this day.

Little was known about the status of the hawfinch *Coccothraustes coccothraustes* in Meirionnydd, or indeed Wales, at the time. Breeding of the odd pair had been recorded in the county at a handful of sites, with most records dating back to the 1960s or earlier. Any investigation would be a challenge therefore, though potentially a meaningful and indeed pioneering one. Regular visits to the churchyard soon revealed good numbers of birds and allowed a growing familiarity with their behaviour and vocalisations; it was essential to know the latter to make further progress. Movements of birds leaving this obviously important feeding site soon led to the location of a nearby communal roost, the first ever recorded in Meirionnydd and possibly even in Wales. Long watches at this roost, in a large stand of mature Norway spruce, suggested a wintering population of at least 60 birds. It seemed that a significant and largely unknown breeding population existed in the Mawddach and Wnion valleys, and now the challenge was to establish where and why, particularly when the species was assumed to be absent from much of Wales.

Tony Cross

Hawfinch in flight

Survey

Initial searches focussed on what was thought to be suitable breeding habitat – woodland which held a good mix of tree species, particularly beech, which both the literature and casual observations had already suggested was an important food source in this region. Broadleaved woodland is both abundant and relatively species-rich in both valleys, so the scale of the survey was significant. Positive results were immediate and far exceeded even my naive expectations. Breeding hawfinches were found to be distributed throughout both valleys, with the challenge in many woods being not to simply establish occupancy, but rather to ascertain exactly how many pairs were present! This initial survey located pairs at 53 breeding sites between 1999 and 2003. Nineteen of these were found in a mixed broadleaf/conifer woodland near Dolgellau; smaller breeding concentrations were noted at five other sites, with other pairs apparently nesting solitarily[1]. Since then this knowledge has been built upon, with around 80 different breeding sites recorded in the two valleys to date. The main colony wood was re-surveyed in 2013, with an estimated 20 pairs present, suggesting a stable population and emphasizing the importance of this particular site for the species. Repeat visits to breeding sites over this period has revealed a good degree of site fidelity, with pairs being found in the same sites, often in the same specific locations, from year to year.

Habitat

Nest site selection has proven highly variable during the study, with a range of differing habitats used. These have included town centre churchyards and river-corridors, gardens, school grounds, an orchard, conifer plantations and even upland fringe *ffridd* habitat. Breeding has also been suspected in roadside tree plantings and an industrial estate. What has been clear throughout the study however, is the importance of mixed-species broadleaved

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Hawfinches feed on both shoots and berries of yew (*Taxus baccata*, ywen)

woodland for providing the necessary food for this species at different stages of the yearly cycle. Even those pairs selecting perhaps more unexpected breeding localities will not be far from stands of favourable broadleaved woodland, and birds can often be observed moving busily to and fro from foraging woods to nesting sites within a town or village.

More typical breeding habitat is found in woodland holding a mixture of species such as beech, hornbeam, oak, birch, ash, wild cherry, sycamore and, more rarely, wych elm and small-leaved lime. Pairs can be found in more typical 'western' oak-dominated stands, though again these will never be far from the more varied mixed woodland this species requires. Small flocks of hawfinches will often be seen feeding in beech in early spring, then birch as spring progresses, and certainly any hornbeam or wych elm if available. Oak, and possibly birch, will provide the invertebrate prey fed to young during the nesting phase; cherry is then sought out during the summer as the young fledge. The few, though significant, hornbeam stands will be favoured as summer ends, with activity in the hornbeam and beech woods extending into autumn and winter in a good mast year. Yew is preferred in autumn and through the winter to early spring, with both vegetative growth and fruit utilised.

Radio-tracking work by the RSPB this year followed two birds in the post-breeding period[2] and revealed the importance of other food sources in the wider countryside, such as rowan berries which can provide a rich food source in late summer and autumn. No doubt much is still to be learned about how this species functions and forages in the landscape, but this broad-scale assessment is required to fully understand the ecology of what is obviously a mobile and wide-ranging species.

Roosts

Five communal roosts have been found during the study, all in mature conifer plantations managed for timber production. Four were located in stands of Norway spruce, the fifth in noble fir. The very first roost, found at Llanelltyd in January 1997, is still in use. It is occupied year-round, with the birds present during the breeding season presumably being unpaired birds. This site has the highest roost count to date, 104 in October 2011. Accurate counts at other sites are often difficult due to topography and lack of vantage points.

The location of these roost sites is not always easy to explain, though all may provide varied functions at different stages of the annual cycle, giving shelter, interaction and communication at locations near breeding sites, feeding sites and even migratory routes. The most northerly roost, in Coed y Brenin, is some 7km away from the main breeding range to the south and could perhaps be linked to migration: significant movements have been noted over the forest in both northerly and southerly directions during the autumn and winter. It is not yet known where these birds are flying to, or from, though hawfinches ringed at a nest site in the Mawddach Valley have been recorded 22km to the north in the Maentwrog Valley during the winter, clearly illustrating the mobility of this species. The most southerly roost, within the main breeding colony wood, is mainly used in the spring and summer months when diurnal activity here is at its peak. The two roosts at Llanelltyd, less than a kilometre apart, lie a short distance from a strongly favoured churchyard feeding site, where significant congregations of birds are seen throughout the year, most notably in the autumn and winter periods. The recent radio-tracking work has shown that individual birds are not faithful to specific roosts and will regularly move

Tony Cross

between sites. This behaviour may possibly reflect the function of information exchange which has been attributed to raven roosts on Anglesey[3], with birds constantly gathering and receiving information on the best foraging areas within their range.

Ringing

The presence of these large roosts and widespread breeding quickly led me to ask whether a viable ringing project could be mounted, to help understand this population and the birds' ecology in the region. Drawing on the methods used by Jerry Lewis and his team in Gwent, Tony Cross and I starting baiting with sunflower seed and mist-netting at a wood near Dolgellau during late winter 2010-11. What followed has been something of a revelation.

In the first winter alone, 128 birds were caught and ringed, 58 of these being re-trapped. One of the early ringing visits caught a bird ringed as an adult in southern Norway in April 2010, some 925km from its original ringing site. Colour ringing was quickly adopted as a means of enhancing the chances of subsequent re-sighting, and the netting techniques were refined to increase catches.

To date, in excess of 800 birds have been ringed or colour-ringed, with nearly 2,000 re-traps or re-sightings of colour-ringed birds. Two movements to Scandinavia have been recorded, one only known from a ring found in an owl box! Other outward movements have been recorded to the Forest of Dean and Machynlleth and, as noted earlier, north to Maentwrog. Inward migrations have involved birds ringed in Somerset, Gwent and Cumbria, the latter involving a young female which had travelled 115 miles south to Wales in the first twelve months of her life. The capture of the Norwegian birds and the marked difference in body weight of some individuals caught in early spring suggests the winter population is boosted by Continental migrants.

Colour ringing has also allowed a greater understanding of the degree to which hawfinches use food sources provided at garden feeding stations. A remarkable 181 individual colour-ringed birds were

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Varied wooded terrain at Llanelltyd

Tony Cross

Hawfinch eggs

recorded in one small garden in Dolgellau during 2015[4], which shows how important this food source could be in the early-spring and post-fledging periods. Such facets of the species' behaviour can only be fully appreciated through ringing studies such as this, and it is hoped the project will continue to provide information on population size, movements, and both site and pair fidelity.

Why Dolgellau?

This study might suggest that the hawfinch is under-recorded in Wales and awaits discovery in other quiet, under-watched regions. Nevertheless, it would seem likely that the Dolgellau area is particularly favourable for this species. There are perhaps two significant reasons for this. Firstly, both the Mawddach and Wnion valleys have retained a well-wooded character at their lower altitudes, with extensive tracts of deciduous/mixed woodland. The topography and generally poor soils of these deep upland valleys means they have escaped the general agricultural intensification found elsewhere. Analysis has suggested that hawfinch populations are more likely to persist in landscapes with a favourable proportion of deciduous/mixed woodland[5].

Secondly, the history and nature of land ownership in these valleys has determined the character of the local woodland. Much was established and managed by a number of large estates, such as Nannau and Caerynwch, the former having extended to a considerable 12,000 acres in its heyday. Such estates, with their associated history and tradition of woodland management for timber, ornament, deer and game, would have afforded some protection against conversion to sheep pasture and arable cropping. They would also have allowed, either directly or through the sale of land to state forestry enterprise, a recovery of the woodland landscape following the great wartime timber harvesting initiatives of the early 20th century, diversifying the woodland character and composition of these valleys. It is likely that the establishment by the Nannau Estate (and to a lesser extent Caerynwch) of beech and hornbeam stands has enhanced and partly shaped the distribution of the hawfinch in this district.

This crucial species diversity is augmented across these valleys on ground shaped by centuries of management by estates, large and small, such as Garthangharad, Caerdeon, Abergwynant, Glan y Mawddach and Farchynys. These managed woods, plantations, parks and gardens are supplemented by the extensive tracts of more 'semi-natural' woodland found on these hills, and again through the post-war

Tony Cross

plantings of the Forestry Commission which provide both forage and shelter for this species.

It is these factors, complemented again by the historic yews of our churches, the rowan and hawthorn of our farmland, a growing passion for feeding birds in our gardens, and perhaps even our mild climate, that combine to create a landscape favourable for hawfinches. A recent assessment of the status of the hawfinch states that Meirionnydd is one of three important areas for the species in Britain, the others being the New Forest and the Forest of Dean[6].

The future

The declines reported across much of the species' range in the UK are drastic. The Bird Atlas 2007-11 documents disappearance from over 75% of the 1968-72 breeding range, with former strongholds such as south-east England recording huge declines[7]. Ongoing research by the RSPB has yet to determine any significant factors which might be driving these declines.

Away from Meirionnydd and the Wye Valley in the south-east, little is known about this species in Wales. It is likely that other populations remain to be discovered and documented, perhaps in areas such as the Conwy Valley and the well-wooded valleys of north-east Wales, where habitat appears favourable and small wintering populations are noted.

Ironically, modern approaches to woodland management and conservation can pose a threat to habitat quality for the hawfinch, as key components such as beech, hornbeam and (to a lesser extent) sycamore are considered non-native in most regions of Wales and management will often favour conversion to native oak. It is vital therefore that we understand the true status and ecology of the species in Wales. Only then can we truly work to secure the presence and conservation of this most spectacular finch, which adds such a dash of exotic colour and mystery to our Welsh woods.

***Dave Smith** works for Natural Resources Wales as a Senior Conservation Officer in Meirionnydd. A licensed bird ringer, all his work on hawfinches is carried out in his spare time.*

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Y gylfinbraff ym Meirionnydd

Aderyn swil a chyfrin yw'r gylfinbraff. Ond mewn dau ddyffryn ger Dolgellau mae'n ymddangos fod y rhywogaeth yn fwy niferus nag a dybiwyd cynt ac mae gwaith arolwg cyson yn awgrymu fod yma boblogaeth sefydlog. Gweddillion hen ystad yw'r dirwedd ac fe'i rheolwyd ar gyfer coetir a gêm yn y gorffennol; ni chafodd felly ei throi'n dir amaethyddol erioed. Mae'r amrywiaeth o goed yn hanfodol ar gyfer arferion bwydo a chlwydo'r adar hyn, ac mae'r gymysgedd o goed collddail yn arbennig o bwysig. Mae rhaglen fodrwyo a thracio gyda radios wedi dangos fod yr adar yn crwydro drwy'r dirwedd ehangach ac yn symud yn gyson rhwng gwahanol glwydfannau. Mae adar a fodrwywyd yng Ngwlad yr Haf, Gwent a Chumbria hefyd wedi ymuno â'r boblogaeth, yn ogystal â dau aderyn o Sgandinafia. Mae'r gylfinbraff yn prinhau yn y DU ac mae'r boblogaeth hon ym Meirionnydd yn allweddol felly.

Tim Birkhead

Long lives, short memories: guillemots on Skomer since the 1930s

Guillemots *Uria aalge* Gwylogod

In earlier articles in Natur Cymru *30 and 52,* ***TIM BIRKHEAD*** *described in detail his long-term monitoring of guillemots on Skomer which began in 1972. Now he turns detective to discover how many guillemots were there when RM Lockley took photographs in 1934, and why numbers fell by a staggering 95% over the next 40 years.*

The International Ornithological Congress (IOC) is a significant event for ornithologists. The 1934 meeting took place in Oxford, with a field trip on 5 July to the Pembrokeshire islands of Skomer, Skokholm and Grassholm aboard the Admirality's destroyers HMS *Windsor* and HMS *Wolfhound*. Margaret Morse Nice – one of very few women ornithologists then – wrote of the excursion: 'the greatest sight of all was an immense cliff crowded with thousands of Guillemots'[1]. That can only have meant Skomer Island's largest seabird cliff, the Wick. The IOC vice-president that year was King Ferdinand of Bulgaria who, as Wikipedia makes clear, was a complex man. The journal *British Birds* subsequently published an image of him together with Ronald Lockley, examining a photographic panorama of the Wick, taken by Lockley earlier that year[2].

As a D.Phil (PhD) student in the 1970s I was intrigued by the *British Birds* photograph and suggested to one of my supervisors that he should ask Lockley if we could borrow the panorama. In due course the

six negatives arrived and we had 10 x 8" prints made. The photographs were taken on a plate camera[3]; the 4 x 5½" negatives provided excellent prints, although not quite good enough to count individual guillemots. Nonetheless, using these photographs taken on 27 May 1934, I was able to plot the distribution of guillemots and compare it with the situation in 1974[4].

The contrast was extraordinary. The number of guillemots on the Wick in 1934 was enormous, whereas in 1972, my first field season, it was pitifully small.

It was this decline in the numbers of guillemots – as well as the apparent decline of razorbills and puffins – that prompted David Lack and Chris Perrins, my supervisors at the Edward Grey Institute in Oxford, to seek funding for PhD studentships and research grants to investigate the cause. Their success resulted in three almost contemporaneous D.Phil projects: Ruth Ashcroft on puffins, Clare Lloyd on razorbills and myself on guillemots. David Lack was the most influential ornithologist of the 20th century, well known for his research and writings on the population biology of birds, so we were well placed for undertaking our research. The standard three-year PhD study was far too short to resolve the issue of declining auks – but it was a start. For myself, determined to understand how guillemot populations worked, it was the beginning of a lifelong love affair with both Skomer and guillemots.

Problems for auks in the 1960s

In the 1960s auk populations were having a hard time. The grounding and break-up of the *Torrey Canyon* oil tanker off the Isles of Scilly in 1967 and the Irish Seabird Wreck of 1969 resulted in the death of tens of thousands of seabirds and showed clearly

With permission from Martin Lockley

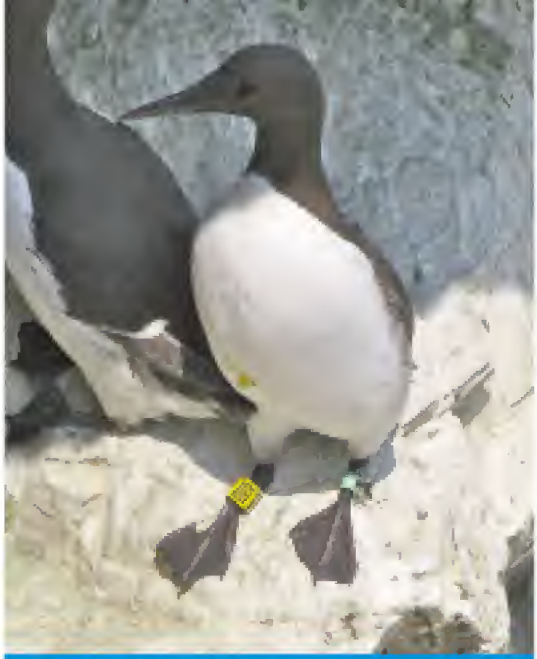
A sketch by Doris Lockley used as an illustration in R. M. Lockley's *Island Days*, published in 1934

in the counts of Skomer's guillemot population made by David Saunders, the island's first warden. At 2,364 individuals, Skomer's guillemot population was at its lowest in 1970, the year following the Irish Seabird Wreck.

David Saunders was a pioneer. In the 1960s, when he started on Skomer, no one had much idea of how to census seabirds; he started an annual count of all species, a practice that continues to this day. For guillemots, David counted individuals rather than pairs or nests, because guillemots breed shoulder to shoulder with no nest. How one translated individuals to pairs was a puzzle whose solution I made a priority during the work for my D.Phil. It turned out that a hundred individual guillemots on the cliffs represented 67 pairs.

However, several previous ornithologists, including Lockley, had muddied the waters as far as guillemot numbers were concerned, by sometimes referring to populations in terms of individuals and sometimes as pairs. For example, he states that in 1930 the entire Skomer population comprised 'at least 5,000 pairs'[5]. In *Island of Skomer* Buxton & Lockley[6] wrote that: 'It was estimated that there were in 1946 5,000 guillemots on Skomer's cliffs at one time, or approximately that number of pairs'. This did not sound like a massive decrease since the 1930s. However, Buxton & Lockley also state: '… we ourselves noticed a very definite decrease in the numbers of guillemots inhabiting the main ledges of

Tim Birkhead



Colour-ringed birds are easier to spot

the Wick in 1946. When we had last seen these ledges in the summer of 1939 there had been no gaps in that long line of breeding guillemots; but in 1946 there were three distinct gaps of unused ledge'.

Lockley's cryptic and cautious wording is unhelpful. 'At least 5,000 pairs' in the 1930s clearly allowed for a much larger population, as the 1934 photographs overwhelmingly suggest. Buxton and Lockley's 1946 estimate of 5,000 guillemots, together with their comment about the breaks in the line of guillemots breeding on the Wick, suggested a substantial decline. Indeed, David Saunders's counts of guillemots during the years 1963-1966 are all around 5,000 individuals, so it is possible that guillemot numbers fell dramatically between the 1930s and 1946 and remained low thereafter right into the 1970s.

Another look at those old photographs

I have spent the last four decades monitoring Skomer's guillemots, and because these are long-lived birds it has taken much of this time to obtain a good understanding of how their population works. The study has involved refining and improving census techniques; measuring the survival of adult and immature birds based on the re-sightings of colour-ringed individuals; and measuring breeding success and the timing of breeding.

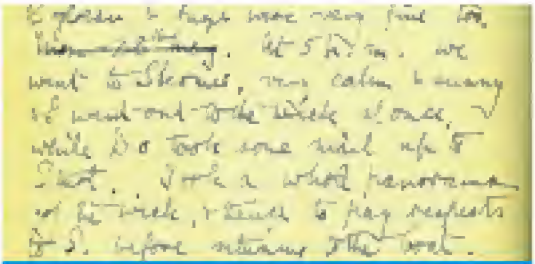
Armed with our much-improved knowledge of guillemot biology, I recently decided to re-visit those 1934 photographs of the Wick to see if I could estimate just how many guillemots there were on Skomer at that time. This would also allow me to estimate the magnitude of the subsequent decline.

My best estimate, based on (i) the length of ledges occupied by breeding guillemots on the Wick, and (ii) the fact that guillemot numbers on the Wick (about 30% of the island's guillemot population) are an excellent barometer of numbers elsewhere on the island, is that there were around 100,000 individual guillemots on Skomer in the 1930s; the methodology is reported elsewhere[7]. Based on those photographs my view is that 100,000 is a minimum. This is because in 1934 when the line of guillemots running along the main fault of the Wick was fully occupied, many of those ledges were up to two metres deep and hence capable of holding larger numbers of birds than an estimate based merely on length of ledge alone suggests.

Possible causes of the decline

It therefore appears that a precipitous decline in guillemot numbers occurred between 1934 and 1946. Buxton and Lockley[6] suggested the most likely cause was oil pollution. I was sceptical, even though we knew that ongoing small oiling events, as well as major ones like the loss of the *Torrey Canyon*, resulted in a noticeable decrease in Skomer's guillemot numbers. I suppose part of my scepticism was linked with Lockley's often rather casual attention to detail. This isn't (really) meant as criticism: Lockley wasn't a trained biologist, but my impression that he was sometimes both economical or profligate with the facts was confirmed by his daughter Ann's recent account of his life in her book *Island Child*[8]. Indeed, it was reading her fascinating and surprisingly frank biography that prompted me to look again at the 1934 photographs and to think about the underlying cause of the guillemot decline. Ann Lockley also comments on the large numbers of oiled guillemots she saw around the Pembrokeshire shores while she was growing up on Skokholm.

To obtain an index of the likely level of oil pollution, I



With permission from Martin Lockley

Entry from Ronald Lockley's diary for 27 May 1934, recording his visit to Skomer from Skokholm to photograph the Wick .

compiled the records of the numbers of ships sunk off the south and west of the UK before, during and immediately after World War II. The numbers were remarkable, although perhaps I shouldn't have been too surprised: there was a war going on! But the numbers of ships sunk in 1940 and 1941 was roughly a hundred times what it had been prior to the war, and what it was subsequently. Those ships would have released oil when they sank, and then continued to release oil, perhaps for years, as they broke up on the seabed.

It seems then that the decline in guillemots during this period was rapid, and enormous, in the region of 95%. We cannot say that it was caused exclusively by oil, but it seems probable.

Oil pollution continues to take its toll on guillemot populations, as our survival studies show[9]. We also know from our tracking studies that Skomer guillemots range widely outside the breeding season, with individual birds moving between the far north of Scotland and as far south as the Bay of Biscay, leaving them vulnerable to oiling incidents anywhere in this vast area.

The future for Skomer's guillemots

I want to finish by saying something about the more recent changes in Skomer's guillemot population. Numbers started to increase in the mid 1980s and have continued to do so, at about 5% per annum – albeit disrupted by a number of oil spills and other events. Our research shows that this increase is driven mainly by the high survival and breeding output of Skomer's guillemots. It is not a result of immigration from elsewhere, although there is some (and also some emigration)[10]. We do not know the underlying cause of the increase. High survival of both adult and immature guillemots probably means that food is more abundant than previously, but we know virtually nothing about the stocks of fish that guillemots feed on. We cannot exclude environmental changes being responsible for changes in fish stocks: the fact that between 1980 and 2000 guillemots started breeding earlier and earlier each year is consistent with a pronounced climate change effect. Another possibility is that the increase is 'merely' a recovery back towards the 1930s level.

It is extremely gratifying that Skomer's guillemots seem to be doing so well, especially since populations further north in the UK are having a very tough time at

Tim Birkhead

Birds crowd the steep cliff faces

Tim Birkhead

It's estimated that 100 individual birds represent 67 pairs

present, with failed breeding and declining numbers. A sustained increase in guillemot numbers on Skomer over the last 30 years is encouraging but, as the situation elsewhere shows all too clearly, it is a fragile situation. Moreover, our shifting-baseline view of the world means that memories are short: a sustained 5% increase and an increase in numbers from 2,634 in 1970 to 25,000 individuals in 2015 sounds wonderful, but it is important to recognize that we are still a long way from the estimated 100,000 individuals of the 1930s. I'd like to think that the increase will continue and that it will reach and exceed 100,000 individuals, although at the current rate of increase that will require three more decades.

As I hope this article shows, the annual, accurate and conscientious monitoring of numbers, survival and breeding success of guillemots and other seabirds is vital if we are to understand their population biology and have any influence over their fate.

Acknowledgements

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***Tim Birkhead** is professor of evolution and behaviour at the University of Sheffield. He has studied and written about birds for over 40 years.*

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Gwylogod ar Ynys Sgomer

Yn ôl ffotograffau a dynnwyd ar Sgomer yn 1934 roedd miloedd o wylogod ar y clogwyni bryd hynny. Mae amcangyfrifon hanesyddol yn ddryslyd gyda rhai yn cyfri parau ac eraill yn cyfri unigolion. Tybir bellach fod mwy na 100,000 o adar yno yn y cyfnod hwnnw. Yn y 1960au dechreuodd David Saunders gyfri adar unigol yn flynyddol a chanfod tua 5,000. Yn 1970 dim ond 2,634 oedd yno, yn rhannol oherwydd yr olew o'r *Torrey Canyo*n yn 1967 a Gwrec Adar Môr Iwerddon yn 1969. Mae'n debyg mai llygredd olew o'r Ail Ryfel Byd oedd yn gyfrifol am y gostyngiad rhwng 1934 a'r 1960au gan fod nifer o longau wedi eu dryllio ym Môr Iwerddon bryd hynny. Byddai'r olew wedi effeithio ar yr adar ac ar eu cyflenwad bwyd. Mae nifer y gwylogod nawr yn cynyddu ac mae tua 25,000 unigolyn yno ar hyn o bryd.

M.J. Hammett

Llyn Tegid – the last stronghold for the glutinous snail

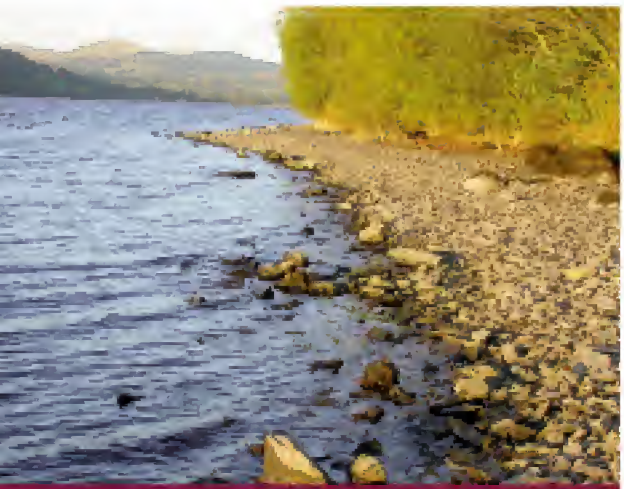
Myxas glutinosa from Llyn Tegid. The mantle extends over the shell (shell length approximately 7 mm)

The snail Myxas glutinosa *is extinct in England but can still be found round the shores of Llyn Tegid. Determined searching at this site discovered it only grows on the underside of submerged rocks.* **MARTIN WILLING** *describes the trials and tribulations involved in the study of this elusive mollusc, and outlines some of the findings.*

The glutinous snail *Myxas glutinosa* is a species with the dubious distinction of being Britain's rarest freshwater mollusc. It has a very thin, globular shell (12-15 mm in length in favourable habitats) which, in life, is covered by the mantle, the fleshy, membranous outgrowth of the body wall that secretes the shell. The English name derives from the gelatinous slime enveloping the body. *Myxas* has been recorded in a variety of still or slow flowing waters such as lowland rivers, canals, lakes and large drainage ditches, in clear, very clean and usually hard water. It is distributed in northern Europe between the Alps and Arctic Circle, but throughout this range is a very local and declining species.

History in England

In the past 170 years *Myxas* has been reported from about 35-40 English locations, mostly in southern and eastern areas. The last recorded sites were Windermere in 1957 and finally an artificial pit near Oxford in 1990[1]. Various recent searches have failed to re-find the snail and, as a consequence, in 2010 Natural England declared the species extinct in England. So why did *Myxas* disappear? The reasons



Myxas habitat on the eastern shore of Llyn Tegid

M.J. Willing

are not entirely clear, but are thought to relate to the snail's extreme sensitivity to pollution, especially nutrient enrichment from agricultural fertilisers and sewage effluent high in nitrates and phosphates. These encourage excessive algal growth, increasing water turbidity and often producing thick mats of filamentous blanket weed (pond algae).

Myxas – a protected species

Because of its rarity *Myxas* has many conservation designations established to protect it. It is a species of Principal Importance on Schedules 41 and 42 of the NERC ACT (2006) in England and Wales respectively, and is protected by inclusion in Schedule 5 of the Wildlife and Countryside Act 1981. In the latest Red List status review for non-marine molluscs in Britain and Ireland[2] it is assessed as critically endangered.

Myxas in Wales

The only confirmed *Myxas* records in Wales are from its largest natural lake, Llyn Tegid (Bala Lake) which lies at the southern fringes of Snowdonia National Park. There are numerous *Myxas* records from the lake between the 1850s and 1953, but a series of detailed searches in the lake between 1960 and 1989[3] failed to detect the snail and it was feared extinct. In autumn 1998 the Countryside Council for Wales and Snowdonia National Park Authority commissioned a 'last chance' survey to confirm the disappearance. It was therefore with delight that *Myxas* was rediscovered[4]. A further unexpected observation was that at this site *Myxas* is only found living on the lower surface of larger rocks. This discovery may partially explain why it had eluded detection in the lake for nearly 40 years. This behaviour is not typical of the species; elsewhere in Europe *Myxas* is usually found crawling on the exposed surfaces of stones, hard underwater structures and aquatic vegetation. Over the next couple of years (1999-2000) further surveys at many additional locations showed *Myxas* presence around approximately 75% of the lake margin (always on rocky shores) but noticeably absent from the muddier south-west side of the lake. Additionally, using the lessons learnt at Llyn Tegid, *Myxas* searches were undertaken at 24 other lakes in Snowdonia and on the island of Anglesey between 1999 and 2002, but all proved unsuccessful.

The initial Llyn Tegid surveys only established the presence of *Myxas* in water depths down to about 0.6m (being the maximum depth that submerged boulders can be lifted from whilst wading). How deep in the lake were *Myxas* living? To answer this question a team of four professional divers undertook searches at six locations around the lake. Spending up to 45 minutes at each site, they recorded details of substratum and possible *Myxas* presence down to about 21 m. The deepest recorded *Myxas* was found at 3.5 m (on an old boot!), but all others were in less than 2.5 m of water. When adjusted for the high lake levels occurring on the dive day, results suggested that *Myxas* are confined to depths of 0.6 – 2.7 m at times of high lake levels but only 0.1 – 2.1 m when lake levels are low (as they often are in the autumn). *Myxas* therefore seems to be a shallow water, lake margin (littoral) species. In these areas of Llyn Tegid, wave turbulence probably keeps the rocks free of the fine sediments that *Myxas* avoids. These shallow areas may also be the depths to which light penetration allows the algal growth on which the *Myxas* feed.

Myxas life cycle in Llyn Tegid

Data on *Myxas* shell length, together with some assessment of reproductive development, were collected at various times from survey stations around the lake in 1998-2001. This information suggested that, in Llyn Tegid, *Myxas* has an annual

I. Hughes

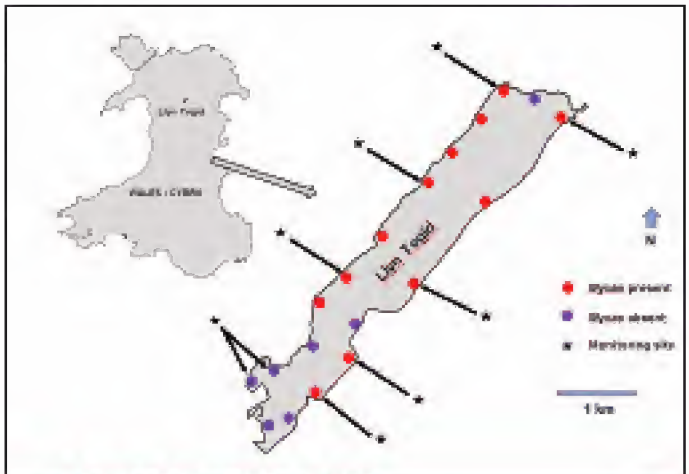
Lower surface of *Myxas* grazing alga on aquarium wall (animal length ca. 8 mm)

life cycle[5] where adult snails reach maturity in late winter, mostly dying off after reproducing in February or March. From April to June only a few adult snails remain, with the tiny young *Myxas* being very difficult to find. By late August juvenile snails again become easier to locate; these grow throughout the autumn, with a decline in numbers partly caused by predation. Elsewhere in Europe, in more favourable hard water conditions, *Myxas* reproduction is often staggered, sometimes including two cycles per year. The life cycle in Llyn Tegid may be a response to unfavourable conditions, with soft water and relatively low nutrients. These conditions may also explain why *Myxas*, along with the few other freshwater snail species in the lake, all have smaller mean sizes compared to those for the UK as a whole.

Long term *Myxas* studies

In 2002 a monitoring programme was developed to allow regular assessments of both *Myxas* populations and their habitat in Llyn Tegid[6]. This involved surveys at eight representative locations around the lake, including one at the muddy southern end where the snail had not been recorded. Survey methods require work in particular conditions with no more than light winds (to minimise wave action) and water levels below a certain maximum. At each site larger rocks are lifted and lower surfaces examined for *Myxas* whilst wading; search effort is equally divided between the water's edge and depths of about 0.6 m. Favourable conditions are achieved by collecting more than a set number of snails from at least six of eight stations. Additionally, habitat condition is assessed based upon the submerged rocks being free from silt, mud and algal overgrowth. Studies of the eight sites have taken place using these monitoring guidelines on four occasions between 2002 and 2014[6]. It is reassuring that during all of this 12 year period *Myxas* and its habitat have been judged to be in 'favourable condition' in the lake.

M. J. Willing



Survey & monitoring stations in Llyn Tegid

Myxas conservation in Llyn Tegid

Water level changes: The restriction of *Myxas* to the shallow lake margins raises a conservation issue. Survey work has shown that relatively rapid changes in lake levels do not produce a corresponding rapid movement by *Myxas* up or down the shore. Thus in 2009[6] monitoring work was undertaken at particularly low lake levels, and although the survey was undertaken in depths down to 0.6m, most *Myxas* were found in under 10 cm of water. The low water levels seemingly had the effect of concentrating the snails into a narrow band in the shallows. In the

weeks following this work, lake levels fell another 8 cm meaning that, unless the *Myxas* migrated to lower levels, many would have died of exposure. In the late 1950s a barrage was built at the outflow end of the lake to control water levels, chiefly to regulate flow into the River Dee to minimise flooding risks downstream. Extreme fluctuations of lake levels following the barrage creation coincided with a period when *Myxas* was not recorded in the lake. Unfortunately there are no records of the speed or extent of lake level falls for this period. It may be that the fall in lake levels partially explains why the snail was not recorded again until 1998, although other factors might also account for this hiatus. These include searches taking place at the wrong time of year, searching in areas of the lake avoided by the snail, or simply not searching below rocks in daylight. It is clear that future plans to alter lake levels should consider the predictable risks to *Myxas* populations of sudden and extreme water level falls. Another important species which is threatened by sudden falls of lake levels is the gwyniad *Coregonus pennantii*, a species of whitefish endemic to Llyn Tegid, which spawns in these rocky shallows.

Nutrient enrichment: A second threat to *Myxas* is the nutrient enrichment of lake waters that results in excessive algal growth and eutrophication. Studies of algal remains (diatoms) in lake sediments show that the lake had lower levels of nutrients in the past, but these began to rise from about 1985. Studies from the mid-2000s[6] suggest that nutrient levels (phosphate, nitrate) were relatively high for an upland lake and probably due to diffuse inputs, chiefly from housing and tourist developments. A possible sign of the enrichment has been the occasional algal blooms (blue-green algae) seen on the surface of the lake since about 1995, with two bloom episodes observed during *Myxas* monitoring visits in 2001 and 2009. On both occasions these were most obvious near the lake shore at Bala, when periods of calm, warm weather were followed by south-westerly winds. The very occasional presence of these blooms does not seem to have affected *Myxas* at this north-eastern end of the lake because snail numbers there have remained high. These observations seem at odds with losses of *Myxas* elsewhere in England blamed on nutrient enrichment. Although *Myxas* seems able to survive these occasional 'bloom' episodes, it should be remembered that the dissolved nutrient levels at the points of algal concentration are no higher than elsewhere in the lake. Fortunately the levels of nutrient enrichment in Llyn Tegid have not yet caused excessive growth of blanket weed (filamentous algae) on shallow-water rocks. Further increases in dissolved nutrients in the lake would certainly be a cause for concern. Encouragingly, water samples collected from Llyn Tegid by Ian Hughes at a *Myxas* site near Bala between October 2014 and January 2015 showed no detectable levels of either phosphate or nitrate.

M. J. Willing

Dafydd Roberts & Bill Taylor (both SNPA) search for *Myxas* in Llyn Tegid

Recent work

As part of the work programme started in October 2014[6], Ian Hughes collected a small sample of live *Myxas* (under NRW licence) together with associated rocks and lake water to study captive animal

I. Hughes

Captive *Myxas* together with newly laid spawn (egg mass) on aquarium wall

behaviour and breeding. Ian's ongoing work has produced some valuable ecological insights into *Myxas* behaviour. He has discovered that the snails emerge from under rocks at night to graze on algae and also do so in isolation, seemingly avoiding close contact with other snails. This may also explain why *Myxas* are rarely found together on the same rock. In March 2015 egg clutches were laid on an aquarium wall which subsequently hatched and survived to reach maturity – a considerable success! This captive breeding (a UK first) opens the exciting possibility of rearing *Myxas* for carefully planned reintroduction programmes in future.

Acknowledgements

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Y falwen ludiog

Nôl yn 2010 cyhoeddwyd bod y falwen ludiog wedi diflannu o Loegr. Ond mae'n dal i fodoli yn Llyn Tegid. Ers 1998 mae arolygon wedi darganfod casgliadau o'r malwod hyn ar hyd tua 75% o lannau'r llyn. Maen nhw'n cael eu darganfod bob amser ar lannau creigiog a byth mewn dŵr sy'n ddyfnach na 2.5m. Yn wahanol i boblogaethau yn Ewrop mae'n ymddangos bod yn well gan falwod Llyn Tegid fyw ar wyneb isaf creigiau, sy'n esbonio pam eu bod nhw'n anodd i'w ffeindio efallai. Pan fydd lefel y dŵr yn gostwng dydyn nhw ddim yn symud i ddŵr dyfnach ac felly maen nhw'n peryglu eu hunain drwy aros mewn band cul o ddŵr bas. Maen nhw hefyd yn sensitif i lygredd, yn enwedig maetholion o wrteithiau amaethyddol a charthffosiaeth, sy'n annog tyfiant alga a thyrfedd yn y dŵr. Llwyddwyd magu malwod gludiog o wyau a gafodd eu dodwy mewn acwariwm, sy'n awgrymu y gallai rhaglen fridio mewn caethiwed fod yn llwyddiannus.

All photos: Amgueddfa Cymru-National Museum Wales

Sharing shells... underwater symbiosis

Two hermit crabs in *Wriggle!* exhibition aquarium

Partnerships between different species always intrigue. What is the relationship between the partners? Is the symbiosis friendly and cooperative, opportunistic, mutually beneficial, or to the detriment of one partner? ***ANDY MACKIE*** *and* ***TIM WHITTON*** *describe the complex relationship between a marine worm and a hermit crab.*

In European seas, there exists a relationship between a marine bristleworm (polychaete) and a hermit crab. It is well-known to marine biologists and fishermen, but may not be immediately obvious to casual observers. The worm is *Neanthes fucata*, a nereid related to the king ragworm that anglers often use as bait, and its host is the common hermit crab *Pagurus bernhardus*. This hermit crab is the largest to be found in Welsh coastal waters, ranging from the lower shore to depths of over 100m, and it most frequently inhabits an empty shell of the common whelk *Buccinum undatum*.

The common whelk is a large gastropod mollusc, up to 10cm long, and the basis of an important Welsh Fishery employing around 100 fishermen using baited pots from small inshore vessels. Marine Management Organisation (MMO) statistics for 2010-14 report average annual landings of 4.56 thousand tonnes, 27% of the UK total. In 2014 this was worth £3.6 million to the Welsh economy and much of the catch goes abroad. An increasing demand for the whelks has developed in the

Far East over the last 20 years.

In 2015, scientists at Amgueddfa Cymru–National Museum Wales began developing ideas for a new exhibition *Wriggle! The Wonderful World of Worms*. The exhibition was to cover all types of worms; however, having three experts in marine polychaetes, these and other annelids (earthworms, leeches and crayfish worms) naturally formed the core! Further, the exhibition was to be for all, from young children to professional scientists. The exhibition opened in July 2016 and a marine aquarium was included with the hermit worm/hermit crab included. Many parents and children will already know about this relationship through the wonderful children's book *Sharing a Shell* by Julia Donaldson and Lydia Monks[1]. A captivating story of a crab, an anemone and a worm each looking for a home, it is a masterful lesson on the benefits of tolerance and cooperation. But what of real life... ?

Hermit crabs, like many other crustaceans, are not noted for their tolerance – particularly with each other. They quickly become aggressive and cannibalistic against any weaker animal, and moulting with growth is a very vulnerable time for any crab. For this reason we now have only one hermit crab on display at any particular time. Trials showed that hermit crabs learn quickly. They recognise when their carer brings food and once they know they are safe from predation they will often stay in unsuitably small or damaged shells despite better alternatives being available. Separating two crabs with a perspex partition will soon cause a dominant crab to try and climb over!

The hermit worm lives high up inside the top spirals of the hermit crab's shell and can only be seen when it stealthily emerges (usually from the right side) when the hermit is feeding. It will swiftly, but carefully, glide over the bases of the crab's legs and claw and bite into the food. (https://twitter.com/CardiffCurator/status/796267090479054848). If the food is substantial a veritable tug-o'-war will ensue, and the strength of the worm's pull is impressive. The crab dare not relax its hold lest it lose its meal completely. Most often, the worm will bite off a portion and disappear back to its lair inside. Sometimes the hermit crab will exhibit clear annoyance with the worm and move its legs and claws as if to shrug it off. It is difficult to imagine that the crab gains anything from the worm stealing its food. This relationship appears to be primarily a meal-sharing and protection commensalism that benefits the worm, while not adversely affecting the crab. However, some detrimental effects cannot be discounted. Lancaster[2] speculated that the worm could perhaps be a threat to a female crab's eggs. Alternatively, it is possible that some unrecognised benefit to the crab occurs. In the children's book *Sharing a Shell* the worm works to keep the crab's shell clean inside!

A fully grown hermit worm can reach a length of around 20cm. It is an attractive worm with orange to pink colouration either side, and a row of variably coalescent spots running along its back from the head. As in most other ragworms, there are four eyes and four anterior sensory appendages; two slender antennae and two larger bi-articulate palps. On either side of the head are four pairs of rather short tentacular cirri. The mouth can be extruded, and bears a pair of sharp, curved and serrated jaws.

The incidence of hermit worm occurrence varies greatly from location to location. In British waters up to 30% of common hermit crabs have been recorded as having a hermit worm; however, a wide review of symbiotic polychaetes[3] reported infestations of 50-90%. The life cycle of the worm is interesting because it can be (at least temporarily) free-living

The hermit worm, here advancing over the crab's right shoulder to steal food

and its relationship with *Pagurus bernhardus* is not exclusive as it can associate also with other hermit crab species. Juveniles settle and live in tubes in the seabed sediments, as do adults that have left a hermit crab's shell – perhaps due to the crab changing shells, moulting or dying. In the presence of a suitable hermit crab, a worm can leave its tube, climb to the top surface of the shell and rapidly enter via the upper lip of the aperture. It is interesting that we have not observed this behaviour in the museum aquaria. When hermit crabs have moved to new shells, the aquarium hermit worms have remained in their original vacated shells, although it is possible that they leave these temporarily, at night for example. It could be that the gravel in the aquarium is too coarse for the worms' normal burrowing, and staying in their shells to await other hermit crabs taking up residence is a better strategy.

Hermit crabs exhibit clear preferences for particular shells. They regularly inspect and try out other empty shells for size and comfort. This involves quickly leaving one shell and entering another. If not satisfied they will sooner or later return to their previous shell. Several researchers have studied hermit worms *in situ* with their host crabs living in glass shells. We have provided different sized glass shells in the museum aquaria and the hermit crabs did try them out. Unfortunately, they soon returned to real shells. In the wild, hermit crabs have been found occasionally living in other receptacles – for example, bivalve shells, hollowed out stones, even the broken top of a bottle. Presumably this happens when suitable shells are unavailable. Therefore, a successful migration to a glass shell will likely necessitate removal of these from the aquarium.

In nature, hermit worms reproduce in May-June and this was replicated in the museum aquaria – although without any noticeable synchronisation. Prior to reproduction, the worms undergo changes in their morphology. The posterior halves of their bodies transform with the lateral 'feet' (parapodia) becoming more elaborate, furnished with large foliaceous lobes and special swimming bristles. Females become lilac or turquoise due to the colour of the oocytes. Males become more pinkish red, with white sperm masses visible laterally. After spawning the worms die.

Neanthes fucata is not the only animal associated with *Pagurus bernhardus*. A large number of different animals have been recorded, their composition often varying from location to location. Some of the other polychaetes include the dorvilleid *Iphitime paguri* and the spirorbin *Circeis paguri* inside the shell, *Polydora* and *Dodecaceria* species burrowing in the

The hermit crab worm *Neanthes fucata* (ca. 14cm)

shell itself, and serpulid tubes such as *Spirobranchus* species (keelworms) encrusting the surface. Other animals include protozoans, anemones, hydroids, bryozoans, encrusting sponges, free-living and parasitic flatworms, ribbonworms, amphipods, barnacles, arthropod parasites, gastropod and bivalve molluscs and sea squirts. Of particular importance, boring polychaetes and sponges will weaken shells and eventually make them vulnerable to damage by other crabs.

The *Wriggle!* exhibition at the National Museum Cardiff will run until 30 September 2017 (https://museum.wales/cardiff/whatson/). Do visit; perhaps you will be lucky enough to see a hermit crab sharing a meal with a worm in the exhibition aquarium?

Acknowledgements

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Selected Further Reading

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Cydfyw yn y Môr

Mae'r cranc meddal Pagurus bernhardus yn byw, gan amlaf, mewn cregyn gwichiaid gwag. Mae sbesimenau sydd mewn caethiwed, fel rhan o arddangosfa ddiweddaraf Amgueddfa Cymru, yn rhoi cyfle i astudio'r berthynas rhwng y cranc meddal a mwydyn gwrychog sy'n byw yng nghogyrnau cregyn y gwichiaid. Mae'r mwydyn yn dod i'r golwg pan fydd y cranc yn bwydo ac mae'n dwyn bwyd o gylch coesau'r cranc, neu hyd yn oed yn ei dynnu o grafangau'r cranc. Mae crancod meddal yn ymosodol ac maen ymddangos fod presenoldeb y mwydod yn eu poenydio. Er nad yw'r berthynas, efallai, yn andwyol i'r cranc mae'n anodd credu ei bod yn fuddiol i'r naill a'r llall. Mae ymchwilwyr wedi darparu cregyn gwydr er mwyn astudio'r berthynas ond mae'n well gan y crancod gregyn iawn. Nid yw cylch bywyd y mwydyn yn ddibynnol ar y cranc. Mae mwydod ifanc yn byw mewn gwaddodion ar wely'r môr a gall oedolion oroesi yno hefyd os nad oes cregyn addas ar gael.

Chris Gomersall (rspb-images.com)

Adar Hela Cymru yn yr Oesoedd Canol

Tystiolaeth Cerddi'r Cyfnod

Cudyll bach *Falco columbarius* Merlin

I ba raddau gall ein llenyddiaeth daflu goleuni ar fywyd gwyllt Cymru yn y gorffennol? Mae cerddi Cymraeg y Canol Oesoedd yn fynhonnell werthfawr o gyfeiriadau a disgrifiadau o adar hela, er nad yw'r dasg o ddehongli'r cerddi hyn yn rhwydd bob amser. Yn yr erthygl hon mae HOWARD WILLIAMS yn rhoi blas i ni o gynnwys y cerddi a'r hyn y maen nhw'n ei ddatgelu am fywyd gwyllt ac am ddiwylliant ac arferion y cyfnod hwnnw.

Rhagarweiniad

Yn ystod hydref 1171 roedd Harri II yn Sir Benfro, yn aros am wynt ffafriol i fynd i'r Iwerddon. Un diwrnod, yn ôl Gerallt Gymro, digwyddodd sylwi ar 'hebog ardderchog yn sefyll ar ryw graig' a gollyngodd yn ei erbyn 'walch mawr rhywiog o Norwy yr oedd yn ei gario'. Ond cododd yr hebog i'r entrychion a phlymiodd i lawr ar aderyn y brenin gan ei fwrw'n farw wrth ei draed.

Er gwaethaf ychydig o eithriadau lliwgar fel hyn mae'r dystiolaeth hanesyddol ynghylch adar yng Nghymru yn teneuo'n arw wrth fynd yn ôl i gyfnodau cyn y bedwaredd ganrif ar bymtheg. Ac mae'r adroddiadau ffeithiol sydd wedi goroesi o'r Oesoedd Canol yn arbennig o brin. Ond un ffynhonnell o wybodaeth nad yw wedi denu llawer o sylw hyd yma yw'r swmp mawr o gerddi sy'n perthyn i'r cyfnod hwn. Lluniwyd y cerddi hyn fel arfer gan feirdd proffesiynol i foli eu noddwyr, sef aelodau'r bonedd gwledig Cymreig. Defnyddiwyd trosiadau adarol bron ym mhob cerdd, nid yn unig i ganmol y noddwr ond hefyd i wawdio ei elynion.

Roedd y ddyfais lenyddol o ddarlunio adar a'u gyrru fel negesydd at gariadon ac at noddwyr hefyd yn ddigon cyffredin.

Yn yr erthygl hon rydym yn canolbwyntio ar ryw ddwsin o gerddi a luniwyd yn bennaf rhwng tua 1450 a 1525. Yn y cerddi hyn mae'r bardd yn gofyn i uchelwr am aderyn hela fel rhodd, fel arfer ar ran uchelwr arall. Roedd cerddi gofyn am hyn a'r llall yn gyffredin ac yn dilyn patrwm sefydlog. Yn ogystal â llinellau sy'n canmol y darpar-roddwr a'r eirchiad, ceir wrth galon y gerdd ddarlun eithaf manwl o'r rhodd a ddeisyfir, ac roedd hyn yn cynnwys aderyn hela yn y cerddi dan sylw. A chan y byddai'r bardd yn datgan ei gerdd yng ngŵydd perchennog yr aderyn mae'n hawdd credu bod peth pwysau arno i beidio â gadael i'w ddychymyg fynd yn rhemp. Ac felly mae'r cerddi'n aml yn cynnwys rhestr o'r rhywogaethau y gobeithiwyd y byddai'r aderyn rhodd yn eu dal. Fel y cawn weld, nid yw'n dasg hawdd i dynnu casgliadau naturiaethol o'r cerddi hyn ond dadleuir yma ei bod yn werth yr ymdrech.

Hebogyddiaeth a Chymru

Yn ystod yr Oesoedd Canol roedd heboca'n boblogaidd ymhlith pobl dda eu byd ar hyd a lled Ewrop, yn cynnwys Cymru. Y prif rywogaethau a ddefnyddiwyd ym Mhrydain oedd y gwalch Marth (*Accipiter gentilis*, Saesneg: goshawk) a'r hebog tramor (*Falco peregrinus*, Saesneg: peregrine falcon). Mae'r gwalch Marth, sydd tua'r un maint â bwncath, wedi esblygu ar gyfer byw mewn coedwigoedd. Mae'r adenydd yn gymharol fyr a'r gynffon yn eithaf hir gan ei alluogi i hedfan mewn lleoedd cyfyng ac i newid cyfeiriad yn gyflym wrth erlid ei brae a gafael ynddo â'i grafangau. Mae hebog tramor tua'r un maint ond yn aderyn llawer trymach a chanddo adenydd hir a chymharol denau; mae'n lladd adar yn yr awyr uwchben tir agored trwy blymio arnynt a'u dyrnu'n rymus â'i draed crafangog gan godi'r prae o'r tir wedyn.

Er mwyn cael gafael ar yr adar hyn i'w hyfforddi ar gyfer heboca roedd angen eu cipio oddi ar eu nythod pan oeddent ar fin hedfan. Nid oedd modd eu magu o'r wy mewn caethiwed. Roedd y nythod mewn mannau anhygyrch, megis ar glogwyni (*falconidae*) neu tua brig coed uchel (*accipitridae*) a menter beryglus oedd cipio'r adar ifanc. Roedd gofyn cael mwy o adnoddau a threfn wrth hela gydag adar teulu'r falconidae na gyda'r accipitridae. Gollyngwyd hebog i gylchu'n uchel yn yr awyr uwchlaw'r prae (e.e. hwyaid gwyllt) ac yna gwnaed twrw mawr i ddychryn a chodi'r hwyaid er mwyn i'r hebog blymio arnynt. Pe bai gormod o oedi ar ôl gollwng yr hebog, byddai'n hedfan i ffwrdd ond pe gollyngid ef yn rhy hwyr byddai'r hwyaid yn eu tro wedi ei heglu hi. Gallai hela ag *accipitridae* fod yn symlach o lawer. Fe ellid eu gollwng mewn llecyn addawol i ganfod ysglyfaeth heb gymorth ychwanegol. Pa ffordd bynnag o hela a ddefnyddiwyd roedd angen ci i ddod â'r prae yn ôl at ei feistr. Cymharwyd hynny â 'rough shooting' ein hoes ni yn hytrach na hela 'driven game'.

Andy Morffew CC BY 2.0

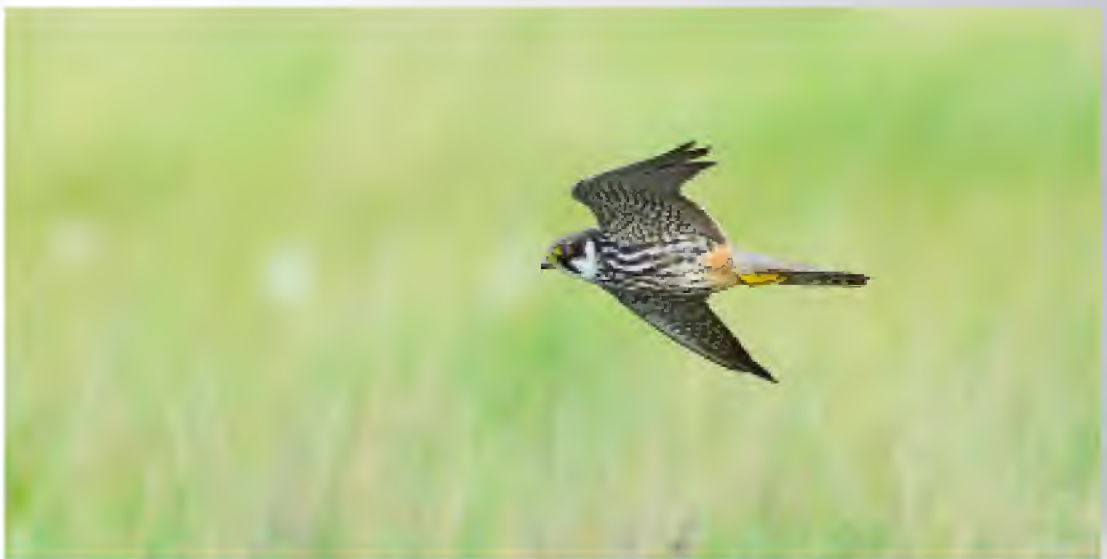
Gwalch Marth *Accipiter gentilis* Goshawk

Mae tystiolaeth ar gael, y tu hwnt i'r farddoniaeth, fod gwylltir Cymru yn ffynhonnell dda o adar hela yn yr Oesoedd Canol. Un o'r trethi enfawr a osodwyd ar arweinwyr Gogledd Cymru gan Athelstan, brenin Lloegr o 924 i 929, oedd cyflenwi adar hela iddo'n flynyddol. Ac yn ôl Gerallt Gymro, yn sgil y ffrwgwd ar y creigiau fe drefnodd Harri'r Ail ei fod yn derbyn cyflenwad o adar heboca, mwy na thebyg hebogiaid tramor, oddi ar glogwyni Cymru (lle gellir eu gwylio o hyd). Yn 1484 cyhoeddwyd gwarant gan frenin Lloegr i gymryd am bris rhesymol "*such goshawks, tarcells, fawcons, laneretts and other hawks as can be gotten within the principality of Wales...as shall be necessary for the king's disport.*" Dychwelwn at y cwestiwn o enwi adar yn y man ond mae'n werth sylwi na ddigwyddodd y cwymp yn nifer y gweilch Marth yng Nghymru tan y ddeunawfed ganrif, a hynny yn sgil erledigaeth gan giperiaid.

Amrywiol Adar

Cyn dychwelyd at yr hebog tramor a'r gwalch Marth mae'n ddiddorol nodi bod cyfeiriadau at sawl aderyn hela arall ym marddoniaeth y cyfnod. Mae Dafydd ap Gwilym yn cymharu cyflymder saeth â hediad yr 'hobel', sef hebog yr ehedydd (*Falco subbuteo*) ac mae gan y bardd o'r bymthegfed ganrif, Siôn Tudur, gerdd lle gyrrir ei 'hobi' fel negesydd serch at ferch ('Os doi â larcs is dy law / Delir a rhain â dwylaw'). Gallai'r beirdd ill dau fod wedi gweld yr aderyn hwn yn y Gororau, lle mae'n ymwelydd hafol o hyd. Rhestrwyd nifer o adar ysglyfaethus eraill i gyfleu mawredd y noddwr a'i deulu, megis yr eryr (hyd syrffed), hebog y gogledd ('sierffawcwn'), y cudyll bach ('merliwn') a'r gwalch glas ('llymestyn'). Ymddengys mai hebog y gogledd yw'r aderyn a laddwyd yn hanesyn Gerallt Gymro ac mae'n sefyll allan yma fel aderyn sy'n annhebygol o fod wedi bod yn bresennol yng Nghymru. Dim ond cyfeiriadau ato wrth fynd heibio sydd gennym ac fe'u hesbonir yn foddhaol drwy dybio fod y bardd wedi clywed am yr aderyn fel un na fyddai ond brenhinoedd a'u tebyg yn ei ddefnyddio.

Mewn dwy gerdd y 'laner' neu'r 'lanred' yw'r enw ar yr aderyn a erchir a cheir y 'lannerett' ymysg y rhestr o adar i'w cipio o Gymru yn y gorchymyn brenhinol a ddyfynwyd uchod. Os mai cyfeiriad at yr hebog gwlanog (*Falco biarmicus*, Saesneg: lanner falcon) yw hwn mae'n dipyn o bos gan mai Affrica yw prif gynefin modern yr aderyn hwn. Mae'n debyg mai ceiliog yr hebog tramor yw'r 'lannerett' (a'r 'fawcons' yn y gorchymyn yw ieir yr hebog tramor) yn hytrach na'r hebog gwlanog. Mae'r ddau'n perthyn yn agos i'w gilydd ac yn defnyddio'r un dull o hela. Byddai 'lanner' yn cael ei ddefnyddio weithiau yn Saesneg i gyfeirio at yr hebog tramor yn ogystal â'r hebog



Ben Andrew (rspb-images.com)

Hebog yr ehedydd *Falco subbuteo* Hobby

gwlanog. Diddorol nodi hefyd fod 'hebog wlanog' (sic) yn un o'r enwau Cymraeg tafodieithol am yr hebog tramor.

Hebog Tramor ynteu Gwalch Marth?

Er gwaethaf y gwahaniaethau a grybwyllwyd uchod, nid yw'n hawdd adnabod yr aderyn hela dan sylw mewn sawl cerdd. Ni ellir dibynnu ar yr enwau a ddefnyddiwyd gan fardd i adnabod a ydynt yn gofyn am walch Marth ynteu hebog tramor. Y label mwyaf cyffredin yw 'gwalch' ond yn yr Oesoedd Canol gallai hwnnw gyfeirio at adar ysglyfaethus o bob math bron. Ac er mai prinnach o lawer yw'r cyfeiriadau at 'hebog' ac er yr ymddengys wrth edrych ar yr holl gyfeiriadaeth yn y cerddi fod sawl 'hebog' yn hebog tramor, mae'n debygol hefyd y gallai'r beirdd fod wedi defnyddio'r gair hwnnw mewn ystyr sydd bron mor gyffredinol â 'gwalch'. At hynny, nid yw'r enw 'gosawg', sy'n swnio yn llawer mwy penodol, yn cyfeirio o reidrwydd at y gwalch Marth. Yn yr un modd â'r enw Saesneg cyfatebol gallai'r enw gwmpasu'r hebog tramor hefyd. Rhaid troi at yr holl ddarlun o'r aderyn mewn cerdd, a hefyd at dystiolaeth allanol, i geisio adnabod y rhywogaeth. Dyma flas ar rai o'r ystyriaethau a'r rheini yn perthyn i faes y naturiaethwr yn hytrach na maes yr hanesydd llên.

Yn gyntaf, gall lleoliad y rhoddwr fod yn arwyddocaol. Mewn pedwar cywydd mae'r rhoddwr yn Fonwysyn. Mae'n debyg mai ychydig iawn o goetir oedd ar yr ynys erbyn y bymthegfed ganrif ac nid yw tirwedd foel o'r fath yn debyg o fod yn gynefin addas i weilch Marth. Ond mewn dau gywydd arall dyn o Whitney, Swydd Henffordd (a oedd yn ardal Gymraeg yn y bymthegfed ganrif) yw'r rhoddwr ac mae tystiolaeth yn y cerddi yn awgrymu mai gwalch Marth yw'r aderyn, sy'n cydfynd â chynefin coediog y Gororau sy'n addas iddo.

Mae disgrifiad bardd o olwg aderyn yn gymorth wrth geisio pennu'r rhywogaeth. Er enghraifft, mewn un gerdd mae gan ei 'osawg' 'adain fain, fel edn o fynydd'. A chymryd mai'r gylfinir yw'r 'edn' hwn, mae'n debygol nad oedd y bardd yn meddwl yma am y gwalch Marth am nad yw ei adenydd yn denau o gwbl. Mewn cywydd arall ceir y llinell 'Secloth wisg, sicl o'th esgyll' wrth ddarlunio 'gosawg'. Mae'r sicl hefyd yn ddisgrifiad da o siâp adenydd yr hebog tramor. Ac, er nad yw'r mater mor glir, mae'r disgrifiad o'r aderyn a erchir mewn cywydd arall fel 'aderyn crwn' yn tueddu i awgrymu mai hebog tramor ydyw am fod crynder yr aderyn, er nad yw'n llythrennol grwn, yn nodwedd amlwg.

Gall cyfeiriadau at liw'r aderyn yn y cywyddau fod yn arwyddocaol hefyd, er nad yw'r gwahaniaethau mor drawiadol â hynny. Yn achos yr hebog tramor mae oedolion y ddau ryw yr un lliw, a'u cefnau yn laslwyd. Lliw llwydfrown sydd ar gefn y gwalch Marth. Felly,

Hebog tramor
Falco peregrinus

Ben Hall (rspb-images.com)

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Adenydd y gwalch marth • The wings of a goshawk

Jacob Spinks CC BY 2.0

Adenydd yr hebog tramor • The wings of a peregrine

mae pwyslais ar lesni'r aderyn yn arwydd mai hebog tramor a erchir, fel y gwelir mewn cyfeiriad un bardd at 'llurig [def 'arfwisg'] loyw a lliw'r iâ glas'.

Yn olaf gall sylwadau prin ar ymddygiad yr adar yn y cywyddau fod yn awgrymog. Ymddengys i Guto'r Glyn gyfeirio at yr ymadrodd Saesneg, 'hawk of the tower', sef enw a seilir ar un o'r dulliau a ddefnyddid wrth ollwng aelodau o deulu'r *falconidae*, wrth ddarlunio ei 'osawg' yntau. Mae'r modd syml o hela a ddarlunir mewn cerdd arall yn fwy addas i'r gwalch Marth na'r 'lanred' a erchir ynddi. Yn ôl bardd arall mae'r aderyn yn un 'a hed yn gyfuwch â haul' a hynny'n awgrymu ei fod yn cyfeirio at ymddygiad yr hebog tramor wrth hedfan yn uchel er mwyn plymio ar ei brae. Ac yn un o'r llinellau mwyaf argyhoeddiadol cyfeirir at yr aderyn fel un sy'n dal ei adenydd 'weithiau fel llyfrau ar lled'. Mae'r llinell hon yn darlunio'r ffordd y mae'r gwalch Marth yn llithro trwy'r awyr bob hyn a hyn heb guro ei adenydd. Yn yr un cywydd cyfeiria'r bardd at ddull yr aderyn o ymosod, sef 'try gylfinir'. Mae hyn yn nodweddiadol o'r gwalch Marth sy'n gafael yn ei brae oddi isod gerfydd ei grafangau, ar ôl ei oddiweddyd, ac yna'n troi drosodd.

Ar y cyfan mae'r ystyriaethau uchod yn arwain at y casgliad mai'r hebog tramor yw'r rhodd yn amlach nag yr hyn a awgrymir gan y gwahanol enwau a roddir ar yr adar yn y cywyddau a bod angen gofal arbennig wrth bennu rhywogaeth sawl 'gosawg'. Ond petrus yw'r casgliad hwn yn enwedig am na ellir rhagdybio bod y beirdd yn rhy gyfarwydd â'r hebog tramor a'i ddull o hela. Mae'n debyg hefyd nad wyddai sawl bardd am y gwahaniaeth ymarferol pwysig rhwng ceiliog a iâr y ddwy rywogaeth, gyda'r ieir yn fwy o faint ac yn fwy gwerthfawr na'r ceiliogod. Nid yw'n anodd credu mai aderyn cyfansawdd a ddisgrifir ambell waith. Wedi'r cwbl, arferid y gamp yn ystod y misoedd pan oedd y tywydd ar ei waethaf a chysuron y plasty ar eu mwyaf atyniadol.

Rhestru Prae

Cael cwymp a wna'r ceiliog coed.
Iechyd corff yw o chaid cig
Ffesant, gwell yw na ffisig.
Iach yw'r hwyaid a chrëyr.
A seigio'r bwn dan siwgr byr.
Try gylfinir, treigl fynyd ,...

Yn y llinellau hyn mae'r bardd yn rhestru prae'r aderyn hela dan sylw. Mae'r arfer hwn bron mor gyson â darlunio'r aderyn ei hun, er bod cyfeiriadau at agweddau iachusol a choginiol i'w gweld hefyd. Yn ogystal â'r prae yn y gerdd uchod ceir enghreifftiau hefyd o wyddau, petrisiaid a hyd yn oed garanod mewn cerddi eraill. Gall rhestrau o'r fath fod yn gymorth wrth geisio adnabod y math o aderyn hela dan ystyriaeth ond nid oes dwywaith na cheir peth gor-ddweud ac ailadrodd o un cywydd i'r llall. Er

enghraifft, cyfeirir at aderyn y bwn fel ysglyfaeth yn amlach na phob aderyn arall ond yr hwyaden wyllt ac mewn dau gywydd mae lladd y bwn druan yn ddigwyddiad dyddiol ('Ar y bwn yr â beunydd'). Ond yng nghyfraith Hywel Dda roedd hebogydd y brenin i fod i dderbyn anrhegion a breintiau arbennig ar ôl i aderyn y bwn gael ei ladd, sy'n awgrymu mai digwyddiad prin oedd lladd aderyn y bwn. Er y gellir tybio fod aderyn y bwn yn eithaf cyffredin yn yr Oesoedd Canol diweddar am nad oedd llawer o'i gynefin corsog wedi ei sychu bryd hynny, mae'n treulio'r rhan fwyaf o'i amser yn llechu o dan gyrs uchel ac mae ganddo guddliw tra effeithiol. Dadleuol hefyd yw'r honiad yn y cywyddau bod garanod a chrehyrod yn cael eu lladd. Er bod hynny'n bosibl, byddai angen hyfforddiant arbennig ar yr aderyn am fod y adar hyn yn rhy fawr a rhy beryglus i fachu sylw naturiol yr hebog tramor na'r gwalch Marth.

Mae pedwar cywydd yn rhestru 'ceiliog y coed' fel ysglyfaeth. Dadleuwyd yn y gorffennol mai grugiar y coed (*Tetrao urogallus*, Saesneg: capercaillie) oedd hwn, ond byddai'r aderyn hwnnw wedi bod yn rhy fawr hefyd i ddenu'r adar hela hyn o dan amodau naturiol. Ystyrir erbyn hyn mai enw am y ffesant, yn fwy na thebyg, oedd 'ceiliog y coed' yn y cyfnod Canol Oesol. Os felly, mae'r cerddi'n awgrymu iddo gyrraedd Gymru yng nghanol y bymthegfed ganrif, a hynny ychydig yn gynharach na'r farn gyffredin.

Math arall o brae sy'n hoff gan weilch Marth gwyllt yw cwningod. Roeddent yn ddigon cyffredin yng Nghymru'r Oesoedd Canol ac fe'u gwerthfawrogid fel bwyd blasus a maethlon. Mae'n anodd credu na fyddai gweilch Marth uchelwyr Cymru yn dal digon o gwningod ond nid oes sôn amdanynt o gwbl wrth restru prae. Hwyrach fod rhesymau cymdeithasol am hynny: ar y naill law gweithgaredd y werin bobl oedd dal cwningod gwyllt ac ar y llaw arall camp uchel ei statws oedd heboca. Ni thyciai felly i uchelwr o fri fynd â'i aderyn gwerthfawr allan i ddal cwningod nac i fardd glodfori'r aderyn am ei allu yn hyn o beth.

Gair i Gloi

Gobeithiaf fod y sylwadau uchod yn dangos na ddylid anwybyddu'r beirdd Cymraeg wrth geisio olrhain hanes rhai adar ysglyfaethus. Ond ni chyfyngir tystiolaeth y cerddi i'r fath adar. Er enghraifft, mae wyth cerdd ar glawr sy'n melltithio tylluanod gan godi cwestiynau gogleisiol am yr union rywogaeth sydd ym meddwl y bardd. A thylluan, gyda llaw, yw'r crogwr mewn un gerdd arall lle mae'r adar yn ffurfio llys barn a'r bardd yn enwi rhyw ugain o actorion gwahanol gan ddefnyddio sawl enw sy'n dipyn o ddirgelwch i ddarllenwyr modern.

Wedi ymddeol o'r Gwasanaeth Sifil yn Llundain symudodd ***Howard Williams*** *i Ddyffryn Teifi gan ymddiddori yn y Gymraeg ac ym mywyd gwyllt Cymru.*

Seiliwyd yr erthygl hon ar Bennod 3 traethawd Ph.D. yr awdur, 'Adar yng Ngwaith y Cywyddwyr', sydd ar gael ar wefan Prifysgol Aberystwyth, http://cadair.aber.ac.uk/dspace/handle/2160/27654. Ceir yno gyfeiradau cyflawn at y ffynonellau a ddefnyddiwyd yn yr erthygl yn ogystal â llyfryddiaeth ar ddiwedd y traethawd.

Birds of prey in Wales – evidence from poetry

Historic references to birds in Wales are rare beyond the 19th century but one interesting source is the Welsh poetry of the Middle Ages, often composed by professional poets to pay homage to their benefactors. In a dozen or so poems, composed between 1450 and 1525, the poet asks a nobleman for the gift of a hunting bird, usually on behalf of another member of the gentry. The poems usually include a detailed description of the bird and also, sometimes, its prey. But determining the precise species can be challenging. The commonest labels are *gwalch* and *hebog* but both of these, in the Middle Ages, could have been used in a general sense for any bird of prey. The poems need to be interpreted in their entirety to arrive at a sensible conclusion – looking at the prey species, descriptions of the landscape and descriptions of how the bird hunts and kills its prey. Personal facts about the poet or the person from whom the gift was being requested, such as the area they came from, can also be helpful. The tentative conclusion is that the peregrine falcon was probably the most common hunting bird requested as a gift, although the diverse use of bird names in the poetry of the period might suggest otherwise.

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The hypothetical otter - Reintroductions: How Would We React?

North American river otters *Lutra Canadensis*

The otter came close to extinction when persistent organochlorine agrochemicals built up in their food supply. Luckily they survived, and nearly all Welsh rivers and lakes now harbour them. But what would the picture be if they had been exterminated? ***ROB PARRY*** *provides his view of the likely arguments; readers might care to extend his ideas to other aquatic mammals.*

The International Union for the Conservation of Nature (IUCN) defines population restoration through reintroduction as: *The intentional movement and release of an organism inside its indigenous range from which it has disappeared to re-establish a viable population of the focal species. IUCN (2013)*

Nothing quite splits opinion amongst nature conservationists than the subject of species reintroductions. Other topics come close, but reintroductions really do seem to get us going. Debate is a good thing and all conservation activities should be questioned, whether it be species reintroductions or something more familiar, such as coppicing or scrub clearance. The more questions asked at the beginning, the better the outcome at the end!

So why the debate?

Simply put, species reintroduction is, to some extent, a step into the unknown. It goes against our tried and tested means of nature conservation, and in a country so ecologically impoverished, can we afford any new unknown variables? A reasonable and understandable

viewpoint, and it therefore follows that species reintroductions should be subject to even more searching questions.

There is however the need for balance.....

The hypothetical otter

The otter *Lutra lutra* is one of Wales' most charismatic species and an emblem for our rivers, streams and wetlands. Today, the species is found throughout most of Wales, from our upland mountains and coastal waters to our rolling countryside and urban towns. However, the otter's history with people has been rather chequered throughout the centuries, as they have suffered from hunting, persecution, habitat loss and even chemical poisoning. Hunting and persecution in Wales dates as far back as documented history, with the Laws of Hywel Dda (940 A.D.) placing a price tag on an otter pelt of 12 pence.

Although difficult to think about, if the hunters of the day were successful in eradicating the otter several hundred years ago, how would we react to their reintroduction back to Wales today? The following is a hypothetical letter from one conservationist to another outlining the concerns and questions one might have regarding the reintroduction of otters to the rivers of Wales.

To whom it may concern

I write as a concerned reader to your proposals to reintroduce the European otter to Wales. From my understanding of the species, it has been extinct in Wales for a number of years and the landscape has changed considerably during that time. I seriously doubt whether the otter could even survive unaided in our landscape today and it would be more like an introduction of a species rather than a reintroduction.

The otter is a large predator and can measure over 1.5m in length from nose to tail. Being a mustelid, which are renowned for their intelligence, inquisitiveness and aggression, do we really want a predator of that magnitude back in Wales today? There are countless stories of their close relative, the North American river otter *Lutra canadensis*, attacking domestic pets and humans when protecting their cubs. Who is to say that the European otter, which is

Martin Richard

European otters *Lutra lutra* Dyfrgw

roughly the same size as *L. canadensis*, won't do likewise? We will no longer be safe to walk our rivers, go fishing or canoeing. I predict a collapse in our rural tourism within months of their reintroduction. With a territory of up to 40km, no one will be safe from them and without any natural predators or means of control they will spread like wildfire across the country.

If the otter was able to adapt to our modern landscape, what of our fish stocks? Salmonids are at the lowest numbers they have ever been in the UK, are you really considering bringing in a fish-eating predator that can consume up to 12% of their body weight in fish a day? It would surely bring an end to many of our fish species in Wales, not to mention our fishing industry. What specific protection will there be for salmonids? What about our only indigenous fish species, the gwyniad *Coregonus pennantii*? What plans do you have for their safeguarding? I am reliably informed that the otter's favoured prey is the eel, a species that is close to extinction in Wales. Imagine, swimming all that way from the Sargasso Sea to our Welsh rivers to breed, only to be eaten by this new animal.

I gather it's not just eels and other fish that feature in the otter's diet, as reports have it that otters can feed quite as readily on terrestrial mammals such as rabbit and even the water vole *Arvicola amphibius*, a species that has already declined rapidly in recent years. The otter's introduction to the water vole's

remaining habitats will surely be the last straw for this iconic species. Bats and even dormice remains have been found in the droppings of otters. Is nothing safe?

What of our amphibians? The European-protected great crested newt *Triturus cristatus* is no match for an otter and otters will decimate whole ponds of them. Anecdotal evidence from the continent tells us that otters, being the clever mustelids that they are, have even found a way of skinning common toads *Bufo bufo*, outwitting the toad's natural toxic defences. If this is true, no amphibian will be safe. Perhaps not even our natterjack toads *Bufo calamita*, another European Protected Species (EPS). Vertebrates aren't the only thing on the menu, as our native white-clawed crayfish *Austropotamobius pallipes* is easy pickings for otters, which are strong enough to turn over stones and boulders in the river channel.

It seems that otters are equally at home around our coast, which means that even marine species are susceptible to the otter's predatory powers. No one has been able to tell me whether there is direct competition with grey seals *Halichoerus grypus*. This seal, which is a qualifying feature of the Skomer Marine Conservation Zone (MCZ) in Pembrokeshire, is said to be doing well at the moment, but who can guarantee this when otters start competing for their food? If otters are at home in the sea, what about our offshore islands such as Skomer and Skokholm? As otters would themselves presumably be an EPS, will there be provisions to kill or remove otters if they did get out to the island? If not, they will surely wipe out our internationally important colonies of puffins *Fratercula arctica* and Manx shearwaters *Puffinus puffinus*.

Wellcome Trust CC BY 4.0

The great bustard was reintroduced to Salisbury Plain in 2004 after being absent for over 170 years.

Lastly, I would like to know if these animals carry diseases. I needn't explain the impact of Bovine Tuberculosis on our countryside, but what provisions have you made to ensure that these mammals won't exacerbate the situation? Is it just Bovine TB we need to worry about or are there other diseases and pathogens that these otters carry?

In summary, I think there are far too many unanswered questions to your plans and I can't see how you could possibly think that otters could once again exist harmoniously in our modern landscape, a landscape that is unrecognisable to the one that otters used to inhabit in Wales all those years ago. There are enough problems to deal with regarding our wildlife at the moment and introducing the otter would only make things worse. After all, we are spending a great deal of money trying to eradicate the American mink *Neovison vison*, so why would we bring in something which is essentially just a larger version?

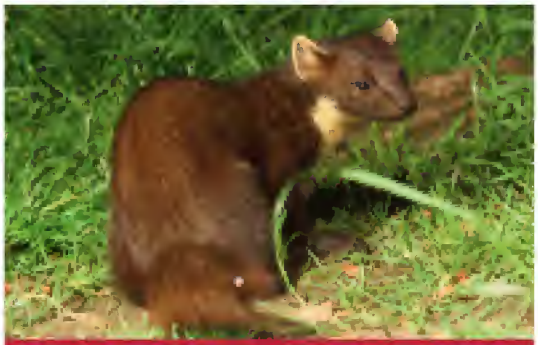
Yours
Mr N. Winner

The catch

The difficulty is that without living alongside otters it would be nearly impossible to say for sure whether the points raised in the letter are valid. We know from our experience that, although issues can occur, otters are an essential component of our freshwater and coastal ecosystems, where they live in 'natural harmony' with their landscape and the species and habitats within it. Without otters, there would be a

gaping hole in our British fauna and our countryside would be a far less diverse and interesting place to live, work and visit.

In the absence of knowledge, the points raised in the letter would surely be enough to conclude that otters have no place in Wales and that the otter reintroduction proposal should be rejected. But would that be the right thing to do?



Alastair Rae CC BY-SA 2.0

In 2015 20 pine martens were transported from Scotland to mid-Wales in a first attempt to establish viable populations

***Rob Parry** is Senior Conservation Manager at Wildlife Trust South and West Wales.*

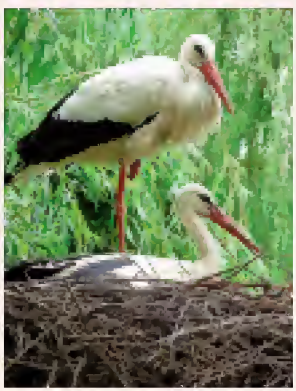
Ailgyflwyno rhywogaethau

Bu bron i ddyfrgwn fynd i ebargofiant yng Nghymru ond yn ffodus fe lwyddon nhw i ddal eu gafael, a bellach maen nhw i'w cael ar hyd a lled Cymru. Dydyn nhw ddim yn achosi unrhyw niwed arwyddocaol i dir na chwaith i fywoliaeth pobl. Ond petaent wedi mynd i ddifancoll byddai rhai, efallai, wedi dadlau yn erbyn eu hailgyflwyno. Gallai darlun fod wedi cael ei baentio o ddyfrgwn fel anifeiliaid ymosodol a allai ddinistrio'n pysgodfeydd. Gyda'u harfer o fwyta amrywiaeth o brae gallent beryglu rhywogaethau prin fel madfallod dŵr cribog a lledaenu haint fel y diciâu, o bosib.

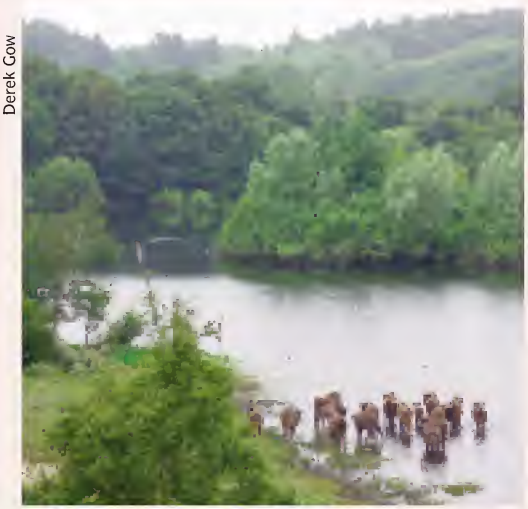
Ceir dadleuon tebyg yn aml wrth drafod ailgyflwyno rhywogaethau eraill. Mewn gwirionedd mae hi bron yn amhosib i ddarogan canlyniad ailgyflwyno, ond byddai'n cefn gwlad yn llawer llai amrywiol a diddorol heb y rhywogaethau brodorol hyn.

Reintroductions

Globally, reintroductions have helped save countless species from extinction and have often given nature conservationists a glimmer of hope that something can be done. In Europe, the reintroductions of species such as white stork *Ciconia ciconia* and European bison *Bison bonasus* are a testament of people's desire to rewrite historic wrongs, placing society at the heart of nature conservation. The European bison was declared extinct in the wild (1919) but, through reintroductions, today thousands of bison once again roam the forests of Poland and Romania.



Derek Gow



Derek Gow

In the UK, after centuries of absence and decades of nature conservation effort, the European beaver *Castor fiber* is now classed as a native species of Scotland. It can be done. We needn't just accept the loss.

John Osley

Mynydd Hiraethog

land-use change and biodiversity 1820 to the present day

Llyn Foel-frech

Mynydd Hiraethog is an extensive tract of rolling upland hills lying to the west of the towns of Denbigh and Ruthin in North Wales. ***JOHN OSLEY*** *charts how it and its wildlife have changed over the last 200 years.*

Mynydd Hiraethog, also known as the Denbigh Moors, covers an area of almost 15,000 hectares to the east of the Conwy Valley in North Wales. Much is above the 350 metre contour reaching a maximum height of 532 m at Mwdwl-eithin. Its geology is of Ludlow and Wenlock mudstones of the Silurian Period (440-400 million years ago), overlain in parts by glacial boulder clay as drumlins, and with frequent peat bodies many metres in depth. There are few crags, extensive rock exposures and deeply incised valleys. The soils are acidic, with low plant-nutrient status and accumulation of surface humus. An impermeable iron-enriched layer (iron-pan) is present, so much of the area is poorly drained.

The natural lakes are Llyn Alwen and Llyn y Foel-frech. The area is drained to the south by the Rivers Alwen, Brenig and Clwyd with drainage to the north by the Rivers Cledwen and Aled. On the north-east margins are streams in steep-sided valleys: the Rivers Concwest, Clywedog and Corris. The area has half the average rainfall of Snowdonia to the west and mean temperatures are higher.

Until the mid-20th century Mynydd Hiraethog was exclusively used as summer grazing for sheep with limited and localised numbers of cattle. Before this, in the Middle Ages, much of the land was part of the extensive ownership of the Cistercian Abbey of Aberconwy, where sheep outnumbered cattle as the livestock of choice. Elfyn Hughes *et al*[1] have calculated that the sheep stocking was of the order of 0.6 'ewe units' per hectare. There is also peat-core evidence for the growth of crops such as wheat and barley during warm periods. In the 19th century the sporting interest of grouse shooting co-existed with the grazing usage but during the past 60 years large estates able to maintain driven grouse shooting have declined.

Government funding of enclosure and agricultural improvement, afforestation and the provision of water supplies to towns and cities such as Rhyl and Chester led, in the 20th century, to a rapid loss of open moorland. In the early 21st century renewable energy generation in the form of wind-farms has been proposed as a new land-use for the area.

Land-use changes from 1820

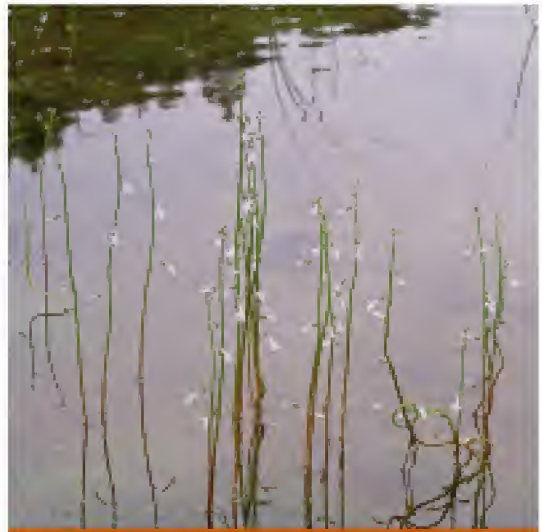
Four major land-use types and proportional changes can be deduced from the sequence of Ordnance Survey (OS) maps for Mynydd Hiraethog dated between 1820 and 2010[2]. These are Unenclosed Mountain (Moorland), Enclosed Mountain (Enclosed Pasture), Forestry (Plantation) and Lake or Reservoir (Open Water).

The information from the maps was augmented with review of documents and publications, examination of aerial photographs and satellite images, and conversations with landowners and graziers. This enabled a time-line of significant changes to be constructed to create 'snapshots' of Mynydd Hiraethog over the past two centuries.

Time-line

1820 Mynydd Hiraethog 14,774 hectares of unenclosed mountain grazing land. It has one pinfold (a pound or enclosure for cattle), 75 sheepfolds and 18 sheep shelters.

1830 The first forestry plantings are made by Lord Bagot. These are commemorated by the monument on the summit of Pincyn Llys (Llys Frenhines).



Water lobelia (*Lobelia dortmanna* Bidoglys y dŵr), one of the uncommon plants present on Mynydd Hiraethog

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1850s Llyn Bran dammed and level raised to create a reservoir for North Wales Mental Hospital, Denbigh.

1870s Last Parliamentary Enclosures Foel Bach, Clocaenog. Rabbit Warren built at south end of Ffridd Foel.

1908 Gwylfa Hiraethog shooting box (lodge) commenced on Bryn Trillyn. This was during the period when grouse moor management was at its most intensive, with annual rotational patch-burning to encourage the growth of young heather shoots to feed the grouse, coupled with rigorous extermination of perceived grouse predators. Total numbers of grouse taken annually not known but likely to have been in the low thousands.

1912 A.A. Dallman[3] describes Mynydd Hiraethog as *"...rather monotonous moorland..."* of heather, bell-heather, bilberry, mat-grass, purple moor-grass and crowberry.

1914 Felling of first forestry plantings during World War I.

1916 Alwen Reservoir constructed to supply drinking water to Birkenhead.

1930 Forestry Commissioners commence planting Clocaenog Forest at Foel Gasnach and Hafotty Wen. Sitka spruce the dominant tree with some Norway spruce, Scots pine, lodgepole pine, European and Japanese larch, silver birch and beech used on

certain soils and rocky terrain and as firebreaks.

1932 Aled Isaf Reservoir constructed and Llyn Aled dammed and raised to supply water to Rhyl.

1936 Sir George Stapledon's survey[4] describes Mynydd Hiraethog as *"...probably the most extensive tract of tended grouse moor in Wales."* Half the total area of 26,710 hectares occupied by heather moor, one fourth in *Nardus–Juncus squarrosus* (calcifugous grassland), one sixth overrun by deer grass, cotton-grass and rushes, and the remaining twelfth being enclosed fields and small patches of fern (bracken) and gorse.

1947 Hobhouse Committee[5] recommend area as proposed Denbigh Moors Conservation Area. This fails to become a designated Area of Outstanding Natural Beauty.

1950s North and South Alwen forestry plantings. Situated between Alwen Reservoir and Llyn Bran, these split the moorland apart into a larger west half and a substantially smaller east half, thereby threatening the viability of both as upland breeding bird habitat.

1960s Penbedw Estate sold and broken up. This was one of the smaller shooting estates. It included Gorsedd Bran, Cefn Brenig and Tir Mostyn.

1965 Sinclair Second Land Utilisation Survey[6]. This continues the findings of both Dallman and Stapledon.

1967 Common Land Units registered. Great majority of rights registered are for sheep grazing and the cutting and taking of rushes. A few rights for cattle grazing, very few for turbary (peat cutting) and one for moss-gathering. Numbers of sheep registered far in excess of 'carrying capacity' of the moorland.

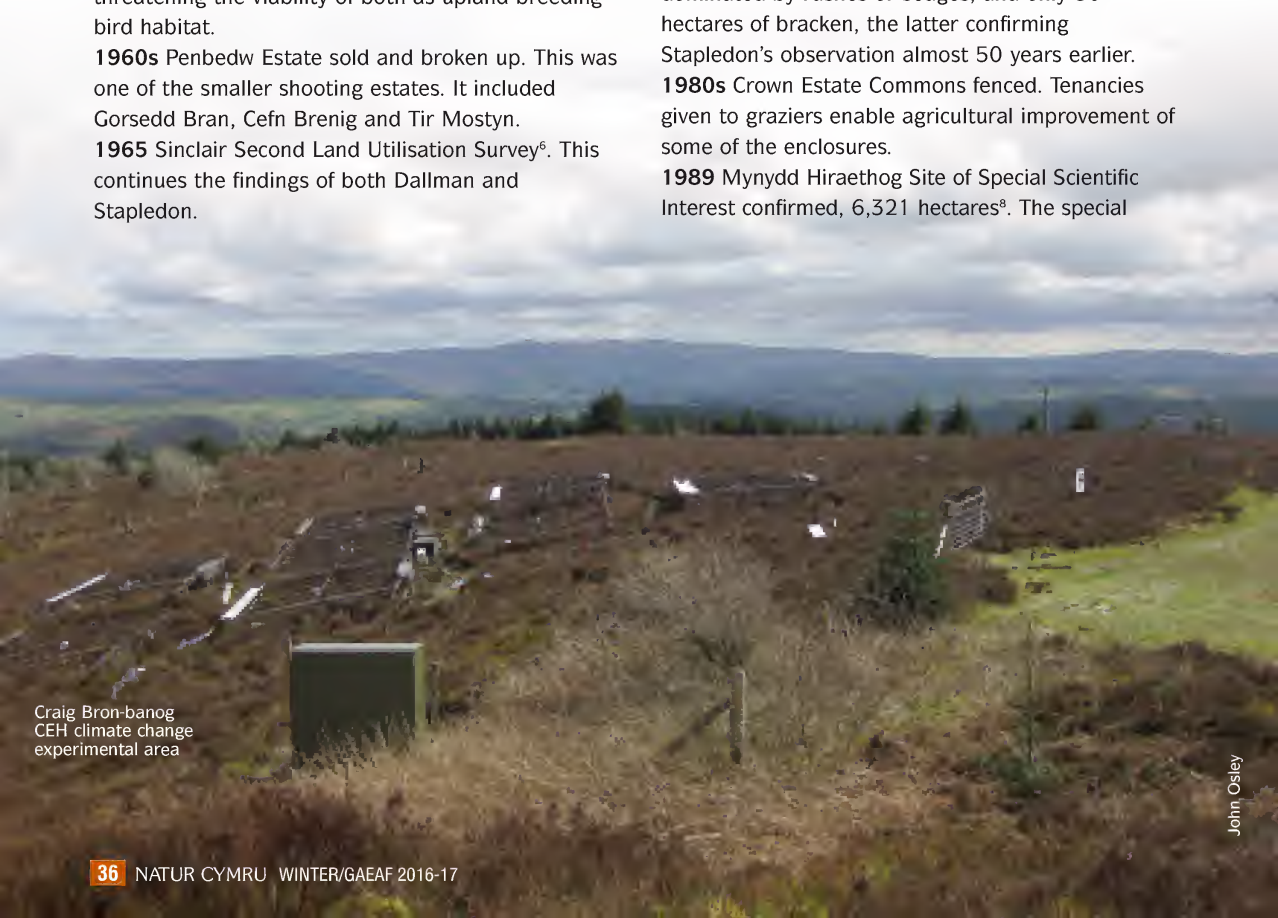
1970s Voelas Estate Common fenced. Grouse shooters insist on plain wire used for the top wire of fences to reduce damage to flying birds.

1976 Brenig Reservoir (Llyn Brenig) constructed. This via the Afon Alwen assists the regulation of flows in the River Dee (Afon Dyfrdwy). supplying drinking water to Chester.

1982 Nature Conservancy Council vegetation survey[7] records: 1,500 hectares dry dwarf shrub heath dominated by heather with 160 hectares of these dominated by bilberry; 3,666 hectares of Nardus–Juncus grassland; 1,278 hectares of bog (wetland vegetation on peat deeper than 0.5 metres); 1,000 hectares of other wetland vegetation dominated by rushes or sedges; and only 50 hectares of bracken, the latter confirming Stapledon's observation almost 50 years earlier.

1980s Crown Estate Commons fenced. Tenancies given to graziers enable agricultural improvement of some of the enclosures.

1989 Mynydd Hiraethog Site of Special Scientific Interest confirmed, 6,321 hectares[8]. The special



Craig Bron-banog CEH climate change experimental area

John Osley

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Common sandpiper (*Actitis hypoleucos* Pibydd y dorlan) on Llyn Aled Isaf

features are dry heath, blanket bog, other associated heath and mire habitats, upland breeding bird assemblage, assemblage of Nationally Rare and Scarce bryophytes and assemblage of Nationally Rare and Scarce invertebrates.

1995 Bryn Ocyn heather ploughed up. This was the largest area of the surviving fragments of moorland outside the main blocks and Clocaenog Forest.

2001 Mynydd Hiraethog Denbigh Moors Landscape of Special Historic Interest designated.

2000s Tir Mostyn and Moel Maelogen wind farms are erected. To be followed by wind farms at Gorsedd Bran, Brenig Woods and Clocaenog Forest amongst others.

Impact of the land-use changes on biodiversity

The wildlife of Mynydd Hiraethog today resides in the reduced but still large extent of dry dwarf shrub heath, blanket bog, mires and acid grassland. These semi-natural habitats support an assemblage of upland breeding birds that includes hen harrier, buzzard, merlin, peregrine, short-eared owl, raven, red grouse, black grouse, snipe, curlew, golden plover, common sandpiper, dunlin, teal, whinchat, stonechat, wheatear, dipper and grey wagtail. Notable bryophytes (mosses and liverworts) include species of *Sphagnum* such as *S. magellanicum* indicative of undisturbed bog and, in base-rich flushes, slender-green feather moss *Hamatocaulis vernicosus*. Uncommon plants present in heather-dominated blanket bog include bog rosemary *Andromeda polifolia* and lesser twayblade *Neottia cordata* and, in the lakes, quillwort *Isoetes lacustris*

Arnstein Rønning CC BY-SA 3.0

Bog rosemary *Andromeda polifolia* Andromeda'r gors

and water lobelia *Lobelia dortmanna*. There is a small colony of large heath *Coenonympha tullia* butterflies as well as rare species of moth, fly, beetle and spider in the bogs and mires. Water voles are known to live along several streams draining the moorland.

Black grouse make use of the adjacent open ground and scattered trees amongst the conifer plantations. Small pearl-bordered fritillary *Boloria selene* colonies survive in the rides where Violets *Viola spp.* and bracken provide food and cover for larvae, and nightjars breed in areas of clear-fell. Small numbers of red squirrels survive in Clocaenog Forest where they use food sources such as the cones of Norway spruce. Dormice have also moved in via the connecting hedgerows from woodlands such as Coed y Fron-wyllt.

Since 1820 the unenclosed mountain of Mynydd Hiraethog has been reduced by 54% to 6,832 hectares. This is divided between a large remnant in the west and several small ones in the east. Nonetheless, the former is sub-divided by fences into either individual sheep-walks or two or three sheep-walks together. The only remaining extensive parcel of unenclosed mountain is the Crown Estate Common Land to the north-east of Llyn Aled. Enclosed pasture has increased from a few small

John Osley

Pincyn Llys (Llys Frehnines) view towards Clwydian Range

isolated enclosures in 1820 to 3,138 hectares today, over 20% of the area. There were two periods of intensive agricultural improvement; the mid-19th century when 900 hectares went under the plough and the mid to late-20th century when 1,453 hectares went the same way. The enclosure of conveniently sized parcels and de facto single ownership provides an incentive for agricultural improvement, permitting an increase in stock numbers and an extended grazing period producing an increased economic return. There appears to be no altitudinal limit to this activity on Mynydd Hiraethog and, where this occurs, the sporting and biodiversity value is reduced close to zero.

From its small beginnings in 1930, afforestation by conifer plantation has spread to cover 31% of Mynydd Hiraethog. To give a return on the cost of establishment and maintenance, these have to be closely planted with fast-growing conifers. Again there appears to be no altitudinal limit, although the wettest, rockiest and most exposed areas probably do not make effective planting sites. Some biodiversity value remains in the small unplanted pockets of land and accrues within the forest. That these have been occupied by black grouse is entirely accidental as was the planting of species of conifer favoured by red squirrel.

With large tracts of Mynydd Hiraethog taken for intensive agriculture and forestry the sporting and biodiversity value of what remains may well become less viable in the long-term. The loss of land under semi-natural vegetation is serious in itself but the land which has been removed for forestry provides cover for carrion crow and fox, predators of the ground-nesting birds such as red grouse, black grouse, golden plover and curlew.

The construction of reservoirs has had a dramatic impact upon the landscape. However, the direct land-take has been minimal, amounting to less than 2% or 236 hectares. It is interesting that concerns regarding pollution and acidification now question the wisdom of planting conifers in reservoir catchments.

Current and future wildlife management

In 1988 the Nature Conservancy Council (NCC) formally notified the owners and occupiers (including those with Common Land rights) of 6,321 hectares of Mynydd Hiraethog as a Site of Special Scientific Interest (SSSI). A small part of this later became the Hafod Elwy National Nature Reserve (NNR). Gors Maen Llwyd, 273 hectares surrounding the northern end of Llyn Brenig, is a North Wales Wildlife Trust reserve.

There are several Management Plans for the habitats and species of Mynydd Hiraethog; the SSSI Site Management Statement, and Biodiversity Action Plans (BAPs) for heath and blanket bog and black grouse and red squirrel. The area is also included in the RSPB's North Wales Moors "Futurescape" and represents about 10% of the project area. Nested within this for Mynydd Hiraethog is the Important Upland Bird Area management plan[9]. This prioritises key areas such as blanket bog for key species such as golden plover.

Effective and long-term management will be required, including resolution of sometimes conflicting priorities in respect of the continuation of low-intensity (extensive) agricultural use, renewable power generation, recreational activities and the protection of water resources. Implementation of these will depend upon the political will to provide the necessary financial and human resources.

Unfortunately major projects for the restoration of peatlands are on hold, as there is great uncertainty with the loss of funding from the European Union. However, it is essential that the landowners and common land rights-holders continue to receive the policy and financial support they most certainly need to secure the unique character of Mynydd Hiraethog and its wildlife into the future.

***Dr John Osley** worked at the Mold Office of the Countryside Council for Wales (formerly the Nature Conservancy Council) for 26 years as a Conservation Officer and is now retired.*

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Mynydd Hiraethog

Mae rhostiroedd Mynydd Hiraethog yn ymestyn dros 15,000 ha yng ngogledd ddwyrain Cymru, ac mae llawer ohonynt yn uwch na 350m. Mae'n sychach ac yn gynhesach nag Eryri tua'r gorllewin, gyda chreigiau agored a rhai cymoedd dwfn. Defnyddiwyd yr ardal yn helaeth ar gyfer pori defaid tan ganol yr 20fed ganrif. Mae mapiau OS, ynghyd â dogfennau a ffotograffau eraill, yn dangos pedwar math o ddefnydd tir a sut y mae'r rhain wedi newid ers 1820. Mae'r rhain yn cynnwys tir mynydd agored, tir mynydd wedi ei gau, coedwigaeth a dŵr agored. Ymhlith y newidiadau mawr sydd wedi digwydd y mae codi argaeau i greu cronfeydd, plannu coed conwydd, rheoli tir ar gyfer saethu grugieir a chodi ffermydd gwynt.

Mae'r ardal yn bwysig ar gyfer gweundir sych, gorgors, corstiroedd a glaswelltir asidaidd. Mae'r rhain i gyd yn cynnal casgliad o adar nythu'r ucheldir yn ogystal â rhai planhigion ac infertebratau anghyffredin.

John Osley

Craig Bron-banog view north west. Immediately to the right of the cairn in mid-far distance is Hafod Elwy Moor

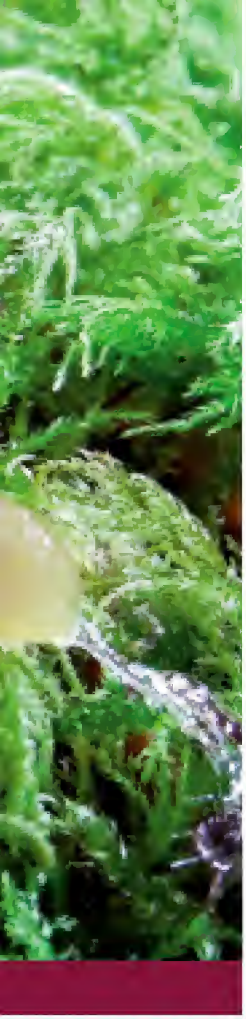
Molluscs as markers in the Living Landscapes of Gwent

Lemon slug *Malacolimax tenellus* at Silent Valley

Slugs and snails can be valuable indicators of the level of biodiversity and overall health of habitats. IMOGEN CAVADINO and BEN ROWSON have been studying three areas in South Wales managed by the Gwent Wildlife Trust and taking samples to examine mollusc populations. It's hoped the data collected will improve our understanding these often tiny creatures, and lead to better management of the sites.

No one is ever far from a mollusc in Wales! Even far inland, and miles from the nearest body of water, our landscape is stuffed with slugs and snails. Many are tiny, and usually go unseen, but molluscs play significant roles in food webs. Herbivorous species can shape wild plant communities with their grazing preferences, while detritivores are essential for breaking down unwanted material. Some species are even carnivores, and many are excellent indicators of habitat quality and history.

The preserved county of Gwent contains a fascinating range of different habitats, some widespread in Wales, others unique. The flat, southern expanses of the Gwent Levels SSSIs contrast strongly with the post-industrial uplands of the Eastern Valleys. The land between the River Usk and the Wye Valley AONB (Area of Outstanding Natural Beauty) forms a rich borderland mosaic. Over the centuries people have shaped and changed all these areas. The introduction of drainage ditches created grazing land, coppicing has shaped the woodlands, and the coal industry has left a lasting mark on parts of the landscape. To reflect this



diversity and history, Gwent Wildlife Trust (GWT) has adopted a Living Landscapes approach to conservation. This aims to increase biodiversity and connectivity between habitats across the county, and to work for both people and wildlife.

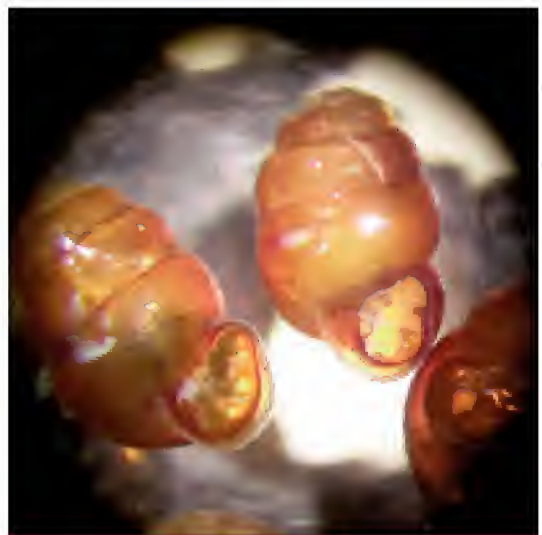
The Conservation Volunteers (TCV) Natural Talent traineeship programme aims to increase expertise across the UK to protect our less well-known species and to create awareness of the habitats that support them. A mollusc traineeship was suggested by Amgueddfa Cymru–National Museum Wales (AC-NMW) to come up with a way to use molluscs as markers. We aim to gain an understanding of the species at GWT reserves and how GWT's management practices may be influencing them. The work consists of three projects, one in each of their Living Landscapes: Usk to Wye, Gwent Levels and Living Valleys. Each project involves fieldwork and the use of the AC-NMW collections (modern, historical and archaeological) and library.

Trawling through literature in search of information on the Gwent molluscs showed that little has been published on this subject. In 1966 the Monmouthshire Wildlife Report even commented that molluscs remained unrecorded in the area. However, interest has grown since then and the total number of mollusc species recorded in VC 35 by February 2015 was 136.

Usk to Wye: Pentwyn and Wyeswood

In this area we are studying grassland molluscs and management. Pentwyn Farm consists of traditionally managed hay meadows containing a rich array of wildflowers, including greater butterfly orchid, common spotted orchid, and common twayblade. Neighbouring Wyeswood Common is very different, comprising 42 hectares of former dairy pasture where 40 years of intense agriculture has resulted in low plant diversity and fields dominated by grasses such as Yorkshire fog and perennial rye grass (see *Natur Cymru* 27:8). Since purchasing Wyeswood Common in 2008, GWT have embarked on an ambitious project to restore its wildflower meadows, a process that could take over 100 years to fully achieve. Comparing the molluscs of the sites would establish which species are present and to what extent they mirror the responses of the plant diversity.

To do this we used a novel method – suction sampling. While used regularly by entomologists, this is one of the first times suction has been used to look exclusively at molluscs. Fieldwork took place in early July before the fields were mown, when conditions were dry but still provided vegetation shelter for slugs and snails. We were impressed with the success of the technique at extracting the smallest snails (many under 2mm across), while also handling slugs of different species and size well. It was much faster than searching by hand, created minimal disturbance to the site, and we could record the diversity of each field in a quantitative way. The more abundant species included *Vertigo pygmaea* (common whorl snail), *Punctum pygmaeum* (dwarf snail), *Cochlicopa lubrica* (slippery moss snail) and *Nesovitrea hammonis* (rayed glass snail).



Imogen Cavadino

Vertigo pygmaea under magnification

Ben Rowe

Sampling a grip (shallow drainage area) at Great Traston Meadows

While analysis is not yet complete, differences between the two sites were stark. Both the richness and abundance of snails were much lower in the fields of Wyeswood Common than the meadows of Pentwyn Farm. Even *C. lubrica*, a species common in a range of habitats, was absent from many fields and noticeably less abundant in Wyeswood Common. More detailed analysis should show whether GWT's restoration work is having an effect in certain fields, as well as being a baseline for future comparison.

Gwent Levels: marsh and meadows

On the Gwent Levels our focus has been on freshwater molluscs: snails and bivalves. The GWT sites at Magor Marsh and Great Traston Meadows consist of grazing fields and hay meadows, intersected and bordered by a network of drainage ditches and shallow drainage features or 'grips'. Both sites have regular sightings of one of Britain's rarest bumblebees, the shrill carder *Bombus sylvarum*, and host a range of other rare or protected invertebrates. Magor Marsh SSSI is the last relatively natural wetland site on the Gwent Levels and it was the desire to protect this site that led to the formation of Gwent Wildlife Trust in 1963. Given the site's importance to GWT's history, the molluscan fauna is relatively well known. However, this is the first comparative study with another GWT site, Great Traston Meadows SSSI (formerly known as Solutia Meadows). It was previously intensively managed farmland, but a change in site management by GWT in 2003 has seen the grassland areas become richer in flower species. The ditches themselves are also quite different in structure, being generally shallower and with less sediment than those at Magor Marsh.

One focus of our study is the effect of ditch-side vegetation on the abundance and richness of freshwater mollusc species. This meant sampling shaded and unshaded ditches using a hand net and sieve. Sampling took place at both sites during April and May, when adult snails were present. A combined total of 58 ditches were sampled, as well as nine full grips. This amount of material should ensure a complete list of freshwater molluscs found at each site and show any differences between and throughout sites. If diversity in heavily vegetated and shaded ditches is low then there may be the need to clear the vegetation to increase biodiversity.

There is still a large amount of material and data to process. However, it is evident that molluscs in some ditches are much more diverse and abundant than others. The moss bladder snail *Aplexa hypnorum* was found in many of the shallow grips, which fill with water during wet weather but dry out relatively quickly otherwise. *Aplexa hypnorum* is capable of exploiting this temporary habitat by surviving periodic desiccation.

We found small pea and orb mussels (Pisidiidae and Sphaeriidae) in abundance throughout the site but did not encounter any of the unionid swan or duck mussels, other than one old shell found in dredgings. We also had anecdotal reports of large freshwater mussels from the ditches around Magor Marsh pond, the only open water body left on site. With this in mind we took the plunge, using a boat and makeshift dredge to explore four different areas of the pond. No evidence of live mussels was found, but the expedition was not fruitless as we also took several sediment cores. The shells in the different layers of the core could indicate how the molluscan fauna has changed at Magor Marsh over time.

Living Valleys: Silent Valley

At the edge of Ebbw Vale lies Silent Valley Local Nature Reserve and SSSI, containing two ancient semi-natural beech woodlands, Cwm Merddog & Coed-tyn-y-Gelli. These are the highest beech woodlands in Britain, and some of the most westerly in Europe. The woodland is known to be rich in fungus species, including the only Welsh record of the rare tiered tooth fungus *Hericium cirrhatum*. The site also contains a mosaic of other habitats, including wet woodland, an old colliery spoil tip colonised by heather, bracken-covered slopes, damp grassland areas and the Nant Merddog stream. We focused on three areas of woodland: beech at Cwm Merddog and Coed-tyn-y-Gelli, and an area of wet alder woodland. The woodland sampled at Cwm Merddog was previously part of a pilot project by GWT to create a 'protected area' not accessible to the public or livestock. The woodland at Coed-tyn-y-Gelli is more remote yet more accessible to the public. The wet alder woodland area is also accessible to the public, though conditions underfoot are likely to deter many. All three sites were accessible to livestock, with small numbers of sheep present throughout the reserve.

In each area timed hand-searches were carried out and bags of leaf litter collected, to be dried and sorted off-site. Several exciting discoveries were made in the field, including confirmation of the presence of a native forest species the ash-black slug *Limax cineroniger*, and the first record of the lemon slug *Malacolimax tenellus* for the Ebbw Valley. This elusive species is restricted to ancient woodlands (see *Natur Cymru* 55:49), appearing only in the autumn and winter to feed on the fruiting bodies of fungi, particularly *Russula* and *Boletus* species. While distinctive looking, *M. tenellus* can be easy to overlook and is considered under-recorded, with only 37 LERC records of the species in Wales. It is dependent on continuous tree cover, making it a very good indicator of ancient woodland.

Further results from each project will emerge as the remaining material is processed. The material collected is held at the National Museum of Wales in Cardiff as a valuable resource for future research into Gwent's wildlife. Biological records will be submitted to the Local Records Centre upon the project's completion. We would like to thank Gwent Wildlife Trust for allowing us to sample their sites and for assistance in the field.

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Ben Rowson

Searching for molluscs in beech woodland at Silent Valley

Molysgiaid fel dangosyddion

Gall gwlithod a malwod fod yn ddangosyddion gwerthfawr o iechyd cynefinoedd. Fel rhan o gynllun hyfforddiant ar folysgiaid mae gwaith arolwg wedi bod yn digwydd mewn tair ardal dan ofal Cymdeithas Bywyd Gwyllt Gwent – glaswelltiroedd Pentwyn, cynefinoedd dŵr croyw Magwyr a choedwigoedd ger Glyn Ebwy. Nid oes llawer o ymdrech wedi digwydd i gofnodi molysgiaid a gobeithir y bydd y data yn ein helpu i ddeall eu hanghenion, gan arwain at reolaeth gwell. Gallai hyn olygu clirio ffosydd sydd wedi gordyfu neu sicrhau parhad canopi coediog ar gyfer rhywogaethau coetir.

Snug as a Bug - where insects and other invertebrates go in winter

As autumn draws in, you may notice fewer insects buzzing about. But where have the summer swarms gone? Insects and other invertebrates have evolved a variety of ways to survive the British winter chill.

A place in the sun

It's not only birds that fly south, some butterflies, moths, dragonflies and flies migrate too. The tiny marmalade hoverfly *Episyrphus balteatus*, around 1 cm long, flies all the way to the Mediterranean for its winter retreat. The painted lady butterfly (*Vanessa cardui*, mantell dramor), which spends the summer here, takes the longest migration of any insect, an incredible 9,000 mile round trip from the Arctic Circle to Tropical Africa! In this way many warmth-loving insects avoid the cold altogether.

Suspended animation

Many British invertebrates time their life cycles so that they survive the winter as eggs or pupae when it is too cold to stay active. They remain dormant in this way, waiting to be spurred on by next spring's warmth. Even though the lazy grasshopper of Aesop's fable died when winter came, its children probably survived as eggs to hatch the following year. Many moths, butterflies and bees overwinter as pupae, and though spider webs may disappear in winter, their egg sacs are hidden away.

The big sleep

Some cold-tolerant invertebrates enter dormancy or hibernation over winter, sleeping somewhere sheltered while it is too cold to be active. Harlequin ladybirds (*Harmonia axyridis*) cluster in corners, sometimes in homes, and peacock butterflies (*Aglais io*) find perfect spots to hide in our sheds. Shieldbugs turn brown and shelter amongst dead leaves, whilst queen bumblebees burrow into a bank to hibernate, emerging to seek a new nest site in spring. Some invertebrates make their own shelter. Many spiders, for example, build their own sleeping bags out of silk, and snails seal their shells with a special mucous that sets hard.

Heading down

Earthworms and other soil invertebrates head downwards to avoid getting caught out when the top layer of earth freezes during frosts. Many aquatic invertebrates such as dragonfly nymphs make similar movements, heading from the shallows to deeper water where the temperature stays more constant.

Ben Sale CC BY 2.0

December moth *Poecilocampa populi*
Gwyfyn Rhagfyr

Staying out

There are a few insects that can stand the cold. Some moths, such as the December moth, are kept warm by their furry bodies and heat generated from their wing muscles. Bumblebees can also keep warm this way, and the buff-tailed bumblebee (*Bombus terrestris*) can even be busy through Christmas Day thanks to winter-flowering garden plants and milder weather.

How you can help insects in winter:

- Leave your garden be – dead stems and seed heads provide snug winter hideaways for many small insects. Some seed heads can also be an attractive addition to a winter garden.
- Let ivy grow – the flowers of mature ivy provide a vital late nectar source for pollinating insects to fatten up before migration or hibernation.
- Create log piles, leaf piles and rock piles or even build a bug hotel to offer hibernation habitat for invertebrates.
- Plant winter flowers e.g. *Mahonia*, *Erica* and Hellebores to provide food for pollinators when they wake on sunny winter days.
- Be nice to ice – don't crack the ice on your pond. It helps to insulate the water beneath, keeping it at a steady temperature for pond life, which will get all the oxygen it needs from water plants.
- Help research overwintering bumblebees by submitting your sightings to the 'Winter bumblebees project' online at www.bwars.com

***Clare Dinham**, Conservation Officer, Buglife*

Islands round-up

Joan James

Skokholm Storm petrel boxes

Skokholm

This island holds the largest storm petrel colony in Wales. The adults can of course be caught in mistnets, ringed, and then retrapped in future years to study longevity. It is, however, very difficult to study what is happening in the nest, as these are in fragile rock crevices.

Various nest boxes have been tried in the past, both wooden and plastic, and some pairs have nested in these. However, to encourage more pairs to do so, a special bank of over 100 concrete boxes with wooden backs were built during the summer. The photo shows the boxes in situ, with the Skokholm stone facing partially in place. The boxes can all be inspected from the back. The island staff are about to leave for the winter; they can't wait to return next year, and find out if the petrels like the boxes! The full story is described by Richard Brown in the Skokholm blog dated Sept 2nd.

Skomer

Information on puffin movements outside the breeding season continues to build up, from birds fitted with geolocators weighing only 2gm. Some will remain around the UK and Ireland, others will venture westwards to the Atlantic near Iceland or Greenland. Later in the winter, some move towards the French and Iberian coast, and about 20% even spend a few months in the Mediterranean. Individuals are very consistent in their migratory journeys, and follow the same route, year after year. See Annette Fayette's Skomer blog on 25th July for more on this (skomerisland.blogspot.co.uk).

Ramsey

The Manx Shearwater colony continues to grow after the rats were eradicated in 1999/2000. There were fewer than 900 pairs in 1998, and the population has now grown to 4,800 pairs. This has encouraged similar programmes in Lundy, Scilly and the Shiants.

Grassholm

The wardening team from RSPB Ramsey went out in October to this offshore island, already covered in detail by David Saunders in the summer issue (59) of *Natur Cymru*. The main purpose was to rescue gannets (mostly young birds) which had become entangled in discarded rope and fishing line built into the nests. The total weight of plastic waste on the island has previously been put at 18 tonnes! A team of archaeologists from RCAHMW also went along on the visit to investigate human artefacts on the island. For further details and photos, have a look at Greg Morgan's Ramsey blog in mid-October, via the RSPB website.

Bardsey

The Bird Observatory is still short of weekly visitors, especially when there are no organised groups booked in. Staff and visitors had a fantastic autumn with record-breaking numbers of scarce migrants including wrynecks, and warblers such as yellow-browed, icterine and melodious. A daily ritual is the examination of the moth trap catch, which takes place just after or even during breakfast, see photo!

Geoff Gibbs

Examining the moth trap catches, Bardsey

Geoff Gibbs

Green **Bookshelf**

A Message from Martha
Mark Avery
Bloomsbury
2014
Hardback
£16.99
304 pages

If you have spent any time birding in the forests of the north eastern USA, southern Ontario, or Quebec, you could be forgiven for not realising something is missing. Despite the woodpeckers, finches, and those dazzling warblers, one bird is absent. The 'Martha' of this book's title was the last passenger pigeon. When she fell off her perch in Cincinnati Zoo, sometime between noon and 1pm on September 1, 1914, a species once the most abundant on earth slipped into oblivion.

Mark Avery's book is a personal odyssey to discover the passenger pigeon for himself. The species was a spectacle that makes our winter starling roosts pale into insignificance. Single flocks would take days to pass a single point. Just one nesting colony in Wisconsin covered 850 square miles. That's twelve times the size of Gower or, if you prefer, three times the size of Anglesey.

How was such an extinction accomplished? The slaughter by Europeans was obscene, but Avery concludes it was habitat destruction, as almost always, that was key. The passenger pigeon was exquisitely adapted to the ephemeral mast resources that the old forests produced. As the forests disappeared, so did the bird.

He then sets off on his own road trip, to visit the last haunts of the passenger pigeon. Not surprisingly, with one poignant exception, Americans have completely forgotten about this extraordinary spectacle. But, as Avery explains, the destruction of the passenger pigeon was only part of a wider ecological and humanitarian apocalypse in the USA during the 19th century, from the extirpation of elk to the massacre at Wounded Knee. It's a story we rarely hear from modern America, or its film industry.

Avery brings it back home with a discussion of our own countryside, and our own declining pigeon, the turtle dove. The message from Martha, he concludes, is that we have the knowledge to prevent species extinctions – the only question is if we have the will. After all, we did with the red kite. But for me it was about the meaning of forgetting. The Americans have forgotten their passenger pigeon of a hundred years ago. But we, farmers and nature conservationists alike, have forgotten the wildlife richness of our own countryside that persisted until much more recently. We have grown used to accepting mediocrity.

Avery's book *Fighting for Birds* was mostly autobiographical. His *Inglorious* is a polemic that I suspect will become a footnote when driven grouse shooting goes the way of bear baiting. But this is, for me, his best book. By turns quirky and sad, the story of Martha is both a message and a warning. But are we listening?

Andrew Lucas

The New Wild: Why Invasive Species Will be Nature's Salvation
Fred Pearce
Icon Books
London, 2016,
Hardback £16.99
Paperback £8.99

Anyone working in conservation will recognise the term 'invasive species', and most of us will tend do so in a pejorative sense. *The New Wild: Why Invasive Species Will be Nature's Salvation* is a warning against this simplistic good/bad narrative. But Fred Pearce's excellent and thought-provoking book is also a lesson in why language is so significant a factor in how we interpret and react to the changes in nature that we have wrought.

In the first instance, Fred Pearce argues for a more honest interpretation of the role of 'invasive' species. In particular he argues that their movement and settlement around the world, on the coat-tails of human trade and migration, is facilitated by wider patterns of ecological disruption. Thus understood, 'alien' and 'invasive' species are more often a symptom of the deeper forces driving biodiversity loss that are embedded in capitalist globalisation.

To illustrate, he takes a fresh look at some of the most commonly held 'invasives' horror stories and encourages the reader to consider the broader environmental context. The notable case of Lake Victoria in East Africa is offered for reinterpretation. Collapsing fisheries, ecological disruption and local extinctions of cichlid fish species have been

linked to water hyacinth 'infestations' and the introduced Nile perch respectively. But in both these cases, Pearce argues, 'invasives' are being scapegoated for wider and more profound trends in water pollution and catchment-level environmental decline.

Pearce appeals for readers to "judge species... by what they do or don't do, and not by the label attached to them". This attention to language is important, because human prejudice against notions of otherness and the 'alien' have led to some rather lazy ecological assumptions. The presumption of negative impact of rapid anthropogenic species movement is questionable when cases are examined in detail. For example, 250 tropical marine species have colonised the Mediterranean since the opening of the Suez Canal in 1869 - but only one ascertainable species extinction has been recorded as a consequence.

Most significantly, Pearce makes the case that in the rapidly changing world of the Anthropocene the species that are thriving through our actions have the potential to help us adapt to, and recover from, our environmental sins. For example, the 'novel ecosystems' that are being constructed – particularly in an urban context – may hold the key to nature's climate change adaptation.

In essence, and in a more nature-led application of the phrase 'rewilding', species are moving into niches that we have opened through habitat degradation and other anthropocentric activities. If Pearce is even partly correct, they may offer something of a stabilising influence within local ecosystems in the decades ahead – aiding, rather than hindering, nature's recovery.

Fred Pearce is a pretty rare beast himself – an environmental writer and journalist who is consistently radical in his approach. With this book he has thrown down a substantial gauntlet at the feet of conservationists. There is much to learn and develop if we are open-minded enough to rise to his challenge.

Ian Rappel

Days to Remember – Adventures and reflections of a mountain guide
Rob Collister
Baton Wicks, Sheffield 2016
Paperback
£12.99

Although Rob Collister has travelled widely in his role as a mountain guide he is firmly based in Wales, having lived much of his adult life in Snowdonia. His contributions to *Natur Cymru* include 'Wild Daffodils' in #34 (with Rod Gritten) and 'Taking offence' in #36, attacking excessive fencing erected in upland Snowdonia. He has also written an excellent history of the Snowdonia Society.

His latest book is divided into three sections. The first and longest is *Home Ground Wales*, which is followed by *Abroad* and the shortest section, *Issues*. I began by dipping into chapters such as 'A Botanical Treasure', 'A Wheel in Ardudwy', and 'Mawddach Source to Sea' but soon found that I wanted to read it all. Rob has the enviable ability to describe these days out in mountains or countryside so that the reader can share the author's enthusiasm, even if one has never visited the locality.

The book also gives an insight into the world of the highly skilled, superfit mountain guide who has climbed and skied in many of the most challenging mountain ranges in the world. Though I do not understand all the technical terms, this did not hinder my enjoyment as I read about the rigors of high altitude camps and bivouacs, the amazing vistas, changeable weather and the responsibility of leadership. The importance of dried bananas, brews of tea and the vision of fresh food and hot showers comes across clearly, but also the beauty of small things: lichens, sheets of hoar frost, or a glimpse of ptarmigan.

However, I particularly recommend this book for the discussion of the issues surrounding the increasingly popular sports of mountaineering, skiing and ski touring. Rob clearly loves what he does, but he has become increasingly aware of the damage his fellow enthusiasts are causing to the places they visit. He also describes the damage they are inflicting on the environment by accelerating climate change. Should the people who see the shrinking of glaciers on their annual holiday accept some responsibility? Many do not, but Rob accepts this challenge too, which adds to my admiration for his adventurous life and for his integrity.

Kate Gibbs

Mammal news

Michael D. Smith

Polecat *Mustela putorius* Ffwlbart

Bangor Symposium

In October the North Wales Mammal Group (NWMG) held its first Symposium at Bangor University, centred on the theme of rewilding. Around 130 delegates enjoyed fascinating talks covering past, present and future reintroductions in the UK, Europe and worldwide, from those in the know and those who have been, or are now, involved at the coalface. Dr Fiona Mathews (Chair of the Mammal Society) opened the Symposium with an overview of rewilding (see *Natur Cymru* 48 for several discussions on this subject). The event was enhanced by several interesting workshops: Ric Morris's 'Whose Bone is That?' was snapped up straight away, as was the red squirrel recovery workshop by Craig Shuttleworth, which enabled delegates to carry out postmortems on tissue for further analysis. Great feedback was given by those attending workshops on cetacean acoustics, mammal detectives, and 'using your ears' with bat detectors. NWMG Chair, Sam Dyer, introduced the new, interactive mammal map (see box) and briefly recapped the group's activities over the past year, which included a trip to Bardsey. The day ended with the entertaining Dr Johnny Birks, who had all howling like wolves, literally!

Pine martens

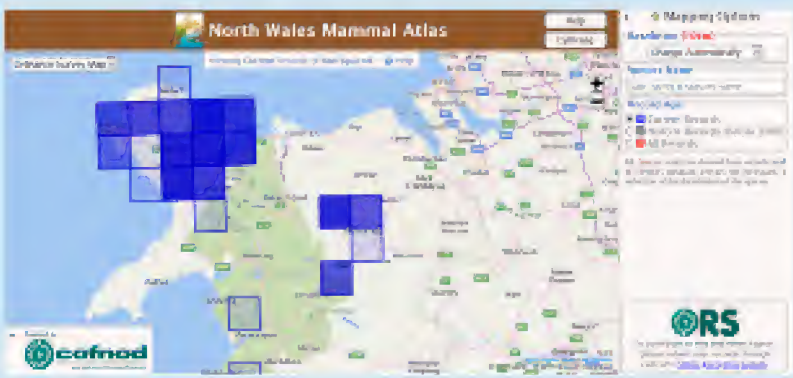
The 20 adult pine martens translocated from northern Scotland to mid Wales in autumn 2015 have been closely monitored by Vincent Wildlife Trust (VWT). As expected, not all survived, but the radio collars enabled postmortems which showed that mortality was from natural causes, mainly predation. In summer 2016 survivors were re-trapped to check them over and remove the radio collars. Those caught so far have all been in good condition and weighing around, or more than, their weights when first released. This is a good sign that they are finding enough food in their newly established Welsh territories. VWT have since been pre-baiting at Scottish sites ahead of autumn 2016 so they can trap and translocate another 20 breeding-age adult martens to mid Wales to further consolidate the Welsh population.

Beavers

The Wildlife Trusts' Welsh Beaver Project has a full-time project officer, Alicia Leow-Dyke, who is funded by the People's Postcode Lottery. A licence application has been submitted to Natural Resources Wales (NRW) for the reintroduction of beavers to a catchment in Wales, and details are being worked up. Links are also being made with the main Welsh universities to develop research opportunities for students on the Project. A public appeal has been launched to further the re-introduction, and you can contribute at www.welshbeaverproject.org/support-the-project

North Wales Mammal Atlas

This Atlas is powered and designed by Cofnod, North Wales's Local Records Centre. You can explore it online at **www.northwalesmammalgroup.com**/ or add your own records – the more records we add, the better the Atlas will be and the more value this tool will have for conservation of our native mammal species!



SurreyJohn CC BY-SA 4.0

Pine marten *Martes martes* Bele

Red Squirrels

A new 3-year project to conserve our native red squirrels has been launched in north Wales. Holly Peek (hollyredsquirrel@gmail.com) and Becky Clews-Roberts (beckyredsquirrel@gmail.com) start in their roles as Red Squirrel Rangers for Gwynedd and Clocaenog Forest respectively. The project is actively recruiting volunteers to help with red squirrel monitoring, grey squirrel control, events, talks and school visits, so please email them if you would like to help or know of any clubs/societies who would like a talk. Visit the Red Squirrels Trust Wales website for further information and links to Facebook and Twitter: www.redsquirrels.info

Water voles

There is worrying news for water voles from Audrey Watson at BASC. With the help of volunteers from Gwynedd Council and NRW she has been looking for water voles in Llŷn, as reported in *Natur Cymru* 58. Llŷn used to be a key population but is now at a low level and may even be lost.

Mammal sightings

Steve Palin noted a stoat at Cook's Bridge near Rossett in May. As he was sitting on a fence watching a grasshopper warbler, the stoat watched Steve as much as he was watching the stoat! Steve also reports a hare at Burton Towers, Burton near Rossett in May, while Nigel Brown is pleased to see hares quite frequently around Llanddyfnan (on arable land) and also on Cors Bodeilio, both on Anglesey. Chris Wynne had a couple of sightings of water shrews at Eithinog and Spinnies (Aberogwen), both Wildlife Trust reserves near Bangor, while Nature Spy got some great video footage to confirm the return of otters to Cemlyn Bay Wildlife Trust reserve www.naturespy.org/2016/08/otters-return-cemlyn-bay.

Steve Palin also found four polecat roadkill carcasses in the last 18 months – three on the A483. Two of those were adjacent to the Wildlife Trust Marford Quarry reserve, and one near Rhosllannerchrugog. The fourth was away from trees or woodland and close to Holt village. The carcasses were sent to VWT as part of their polecat monitoring project (*Natur Cymru* 28), and they confirmed them as pure polecat. The survey also showed that the animals have spread far and wide across most of England and Wales, albeit with a proportion of domestic ferret hybrids amongst them. Bethan Lloyd Jukes reported that her husband has seen a polecat in the field next to their house in Llannerchymedd.

Janet Baker had a wonderful sighting of two dolphins off Tonfannau beach near Tywyn, while Kate Gibbs and Merryl Silsby had an excellent view of five bottlenose dolphins from Pen-y-chain near Pwllheli on October 31st. Finally, there was unusual sighting of a pod of common dolphins in the Swellies area of the Menai Strait on August 30th. These were captured on camera and posted on-line by Ann Evans https://www.facebook.com/ann.r.evans/videos/10209150651390725/ The footage shows behaviour typical of distressed animals finding themselves in a confined and confusing situation. Fortunately they seem to have escaped and no strandings were reported.

Frances Cattanach
Director, North Wales Wildlife Trust

OPAL Yma o Hyd!

Yn ddiweddar daeth y newyddion da bod cynllun OPAL wedi cael ei ymestyn am gyfnod er mwyn parhau â'r gwaith o sbarduno pobl ar hyd a lled Cymru i ymddiddori yn yr amgylchedd naturiol ac i fynd ati i gasglu cofnodion am y byd o'u cwmpas. ***BOB GRIFFITHS*** *o gynllun OPAL sy'n crynhoi cefndir y prosiect ac yn rhannu gwybodaeth am rai o'r llwyddiannau a'r heriau hyd yn hyn.*

Bob Griffiths ©OPAL

Yn ddiweddar cyhoeddodd Peter Ainsworth, cadeirydd y Gronfa Loteri Fawr, fod cynllun OPAL wedi llwyddo denu £1.2miliwn o gyllid pellach er mwyn parhau â'i waith am rhyw flwyddyn ychwanegol.

Y Cefndir

Mae Labordai Awyr Agored (OPAL) yn fenter sy'n hyrwyddo gwyddoniaeth y werin ar draws y DU. Nod y fenter yw gallogi pawb, waeth beth yw eu hoedran, eu cefndir neu eu gallu, i gael profiadau ymarferol o ymwneud â byd natur. Ariennir y cynllun gan y Loteri Genedlaethol.

Mae OPAL yn cynnig adnoddau o ansawdd uchel ynghyd â hyfforddiant a phob math o gymorth arall i alluogi grwpiau cymunedol, ysgolion ac unigolion i gyflawni hyd at 6 arolwg gwahanol gan ddefnyddio rhywogaethau sy'n hawdd i'w hadnabod fel dangosyddion.

Bob Griffiths ©OPAL

Datblygwyd yr arolygon hyn gan nifer o sefydliadau a phrifysgolion, er mwyn galluogi'r cyhoedd i gasglu data a fydd yn helpu rhoi cipolwg i ni ar gyflwr yr amgylchedd yn y DU. Y bwriad hefyd yw defnyddio'r data, lle bo modd, i ddangos newidiadau amgylcheddol ehangach fel newid yn yr hinsawdd neu newid ym maint ardaloedd dosbarthiad rhywogaethau wrth iddyn nhw addasu i gyflyrau gwahanol.

Ers i ni gychwyn yng Nghymru rydym wedi datblygu 2 arolwg newydd i'w hychwanegu at y 6 gwreiddiol. Mae'r arolygon newydd yn canolbwyntio ar adnabod gwahanol bryfed peillio (arolwg Polli: Nation) a chofnodi Llyngyren Ledog Seland Newydd (cafwyd erthygl ar yr arolwg hwn gan Barbara Brown, Gwyddonydd Cymunedol De Cymru, yn rhifyn Awst 2015 o 'Natur Cymru').

Yn eu crynswth felly mae arolygon cyfredol OPAL yn cynnwys y canlynol:

- Chwilio Chwilod (darganfod a chofnodi infertebratau bychain).
- Ansawdd dŵr (edrych ar greaduriaid sy'n byw mewn pyllau a llynnoedd).
- Ansawdd Aer (gan ddefnyddio cennau ar goed fel dangosyddion o lygredd Nitrogen).
- Bioamrywiaeth (edrych ar fywyd mewn gwrychoedd).
- Ansawdd Pridd (gan ddefnyddio rhywogaethau pryfed genwair fel dangosyddion).
- Iechyd Coed (datblygwyd mewn ymateb i'r bygythiad diweddar o glefyd mewn coed Derw ac Onnen).
- Llyngyren Lledog Seland Newydd (gofyn i bobl chwilio am y rhywogaeth estron goresgynnol yma yn eu gerddi).
- Polli:Nation (edrych am wahanol pryfed peillio).

Mae'r arolygon hyn yn addas ar gyfer pob oed a gallu, ac maen nhw wedi cael eu cynllunio i fod yn hawdd i'w hail wneud; mae hyn yn galluogi grwpiau i fonitro'r bywyd gwyllt yn eu hardal leol dros gyfnod hir, neu gymharu nifer o safleoedd o fewn eu hardal leol.

Mae gan y prosiect nifer o amcanion, sef :

- Defnyddio gwyddoniaeth cymunedol ar gyfer ymchwil, cadwraeth ac addysg.
- Newid agwedd pobl, a rhoi pwrpas iddynt dreulio rhagor o amser yn yr awyr iach.
- Ysbrydoli cenhedlaeth newydd o naturiaethwyr.
- Gwella dealltwriaeth o'r byd naturiol.
- Creu partneriaethau cryfach rhwng y sectorau cymunedol, gwirfoddol a statudol.

Llwyddiannau OPAL
Erbyn hyn mae'r prosiect wedi bod ar y gweill am bron i 3 blynedd yma yng Nghymru, ac mae wedi bod yn llwyddiannus iawn. Yn ôl y ffigyrau a gasglwyd hyd at ddiwedd Gorffennaf 2016 rydym:

- Wedi gweithio gyda 30,067 o bobl (112% o'r targed).
- Wedi gweithio gyda 602 o wahanol sefydliadau.
- Wedi mynychu nifer o ddigwyddiadau cenedlaethol, e.e. Sioe Frenhinol Cymru, Eisteddfodau Genedlaethol a'r Urdd.
- Wedi trefnu a rhedeg cynhadledd Gwyddoniaeth Cymunedol ar gyfer Cymru yng Nghaerdydd.
- Wedi gweithio gydag ysgolion cynradd, uwchradd a cholegau (mae 370 o ysgolion cynradd wedi cymryd rhan mewn arolygon OPAL).
- Wedi rhedeg 121 o sesiynau hyfforddiant ar gyfer athrawon, arweinwyr gweithgareddau awyr agored, aelodau o grwpiau cymunedol ac addysgwyr eraill.

Dysgu Gwersi
Dysgwyd nifer o wersi ar hyd y daith. Er enghraifft, mae dwysedd y boblogaeth yn isel iawn drwy rannau helaeth o'r wlad a gall hyn olygu treulio llawer o amser yn teithio er mwyn gweithio efallai gyda nifer fechan iawn o bobl. Er fod hyn yn bwysig er mwyn cynnig yr un cyfleoedd a chefnogaeth i bawb gall fod yn ddrud iawn o ran amser staff a chostau teithio. Rydym yn ymwybodol fod 'na ardaloedd eang o ganolbarth Cymru sydd heb gael rhyw lawer o sylw o gwbl yn ystod y prosiect. Efallai fod yna dueddiad wedi bod i or-ganolbwyntio ar rai ysgolion. Yn sicr mae enw da OPAL yn ymledu: mae'r adnoddau o safon uchel a gellir eu defnyddio sawl gwaith a chan eu fod hefyd yn rhad ac am ddim maen nhw wedi bod yn boblogaidd iawn. Mae nifer fawr o ysgolion a grwpiau eraill wedi rhoi adborth positif ac wedi mynegi lefel uchel o foddhad. Ond rhaid cyfaddef ar y law arall mai nifer weddol isel o bobl sy'n dychwelyd eu canlyniadau i ni, o'i gymharu â'r nifer o becynnau sy'n cael eu dosbarthu. Rydym yn cael nifer fawr o ymholiadau bellach – mwy nag y gallwn ddelio'n effeithiol â hwy efallai.

Y dyfodol
Wrth ennyn ac ehangu diddordeb mewn cofnodi byd natur ar hyd a lled Cymru mae hi wedi bod yr un mor bwysig i ni ystyried gwaddol y prosiect a pharhad y gwaith. Bellach mae pwyllgor Gwyddoniaeth Cymunedol wedi ei sefydlu yng Nghymru gan OPAL, gyda'r bwriad i hybu'r pwnc drwy'r wlad ac mae ymchwil yn dangos fod angen arolygon penodol yng Nghymru er mwyn ateb rhai o'r cwestiynau gwyddonol sydd wedi codi yma yng Nghymru. Teimlwn yn sicr, yn sgil y prosiect hwn, fod gan OPAL ran i'w chwarae yn arwain a chydlynu gweithgareddau Gwyddoniaeth Cymunedol yng Nghymru ac mae partneriaethau newydd wrthi'n cael eu sefydlu a cheisiadau am arian yn cael eu datblygu er mwyn ceisio sicrhau dyfodol i'r prosiect ar ôl 2017.

Gwybodaeth / information
www.opalexplorenature.org
bob.griffiths@cofnod.org.uk

OPAL Still Here!

OPAL (Open Air Laboratories) is a Lottery-funded, UK-wide, citizen science initiative that allows people to get hands-on experience with nature, whatever their age, background or ability level. We provide free, high quality, reusable resources, as well as training and other support to enable community groups, schools and individuals carry out up to eight different surveys identifying species that are easy to recognise as bio-indicators:

- Bug hunts
- Water quality (pond life)
- Air Quality
- Hedge biodiversity
- Soil quality
- Tree health
- New Zealand Flat Worm (see *Natur Cymru* 56).
- Polli: Nation

These surveys are easy to repeat, enabling long-term monitoring or comparing multiple sites within an area. It's hoped they will help people to a better understanding of nature and encourage a new generation of naturalists.

The project has been running for almost 3 years here in Wales. The high quality resources are very popular and we are dealing with an increasing number of enquiries. We're aware that some isolated areas of Wales have not had much attention, and aim to address this.

The data collected will help create a snapshot of the state of the environment in the UK. Research shows that there is a need for Wales-specific surveys to answer scientific questions and we feel that OPAL has a key role to play.

Protecting our ancient woodland - the need for vigilance

It will be no surprise to readers of *Natur Cymru* that one of the priorities of the Woodland Trust (Coed Cadw) is to protect those fairly small areas of ancient woodland that have survived the ravages of time and that still exist today as living archives of their past.

A skilled ecologist can generally identify a genuine ancient woodland by the variety of plants found there, such as bluebell, lesser celandine and wood anemone. Ancient woodlands are, quite literally, a non-renewable resource. Once the complex structure of ancient woodlands has been destroyed, it cannot be recreated, certainly not within normal human timescales.

That's why they are specially protected in Welsh planning policy, a legacy of Sue Essex's time as Environment Minister and an example to our neighbours in England.

But is this far-sighted policy really followed in practice? In Wales, until recently, we have seen comparatively few cases of woods under threat, but over the last two years there has been a profusion of high profile threats.

At Cwm Nant Lleici Quarry near Pontardawe, Natural Resources Wales (NRW) did sterling work in flagging up the irreversible damage that would be caused by a new quarry access road. Rather gallingly, a perfectly serviceable road exists and it's only a dispute between neighbours that prevents its use.

In another high profile case, however, I regret to say that NRW was, initially at least, the watchdog that failed to bark. At the Fairy Glen near Betws-y-Coed, a hydro power scheme would have destroyed two areas of ancient woodland within an SSSI. NRW's initial letter to the National Park Authority, in the summer of 2015, raised no objection, and did not even mention the words 'ancient woodland'. There are also, of course, questions about the impact of the scheme on the mosses, lichens, liverworts and ferns in the gorge, key features of the SSSI.

Critics of the creation of NRW as a new single environmental body for Wales warned that the new body would be unlikely to defend important wildlife sites as CCW had done. The Woodland Trust's view, however, was that the environment is a single whole and there was no reason in principle why a new body should not be able to do this.

To be fair, it must be challenging to pull together a view across the full spectrum of the environment. CCW would often remind planning authorities of key policies, while the Environment Agency saw itself as a "yes, if" organisation.

One thing is clear, however. If the Welsh Government is to meet its aspiration of improving the environmental well-being of Wales, as required by the Well-being of Future Generations Act, then it absolutely needs a body like NRW to consistently point out where major planning applications conflict with key policies and destroy wildlife, rather than protecting and enhancing it.

This piece, however, ends on a positive note. Despite NRW's initial response, the Snowdonia National Park Authority voted to refuse planning permission for the scheme in March 2016, by six votes to five. A very slightly amended version of the plan was resubmitted in August. But by that time, NRW had firmed up its position and flagged up a number of serious concerns. On that basis, the resubmitted application was withdrawn.

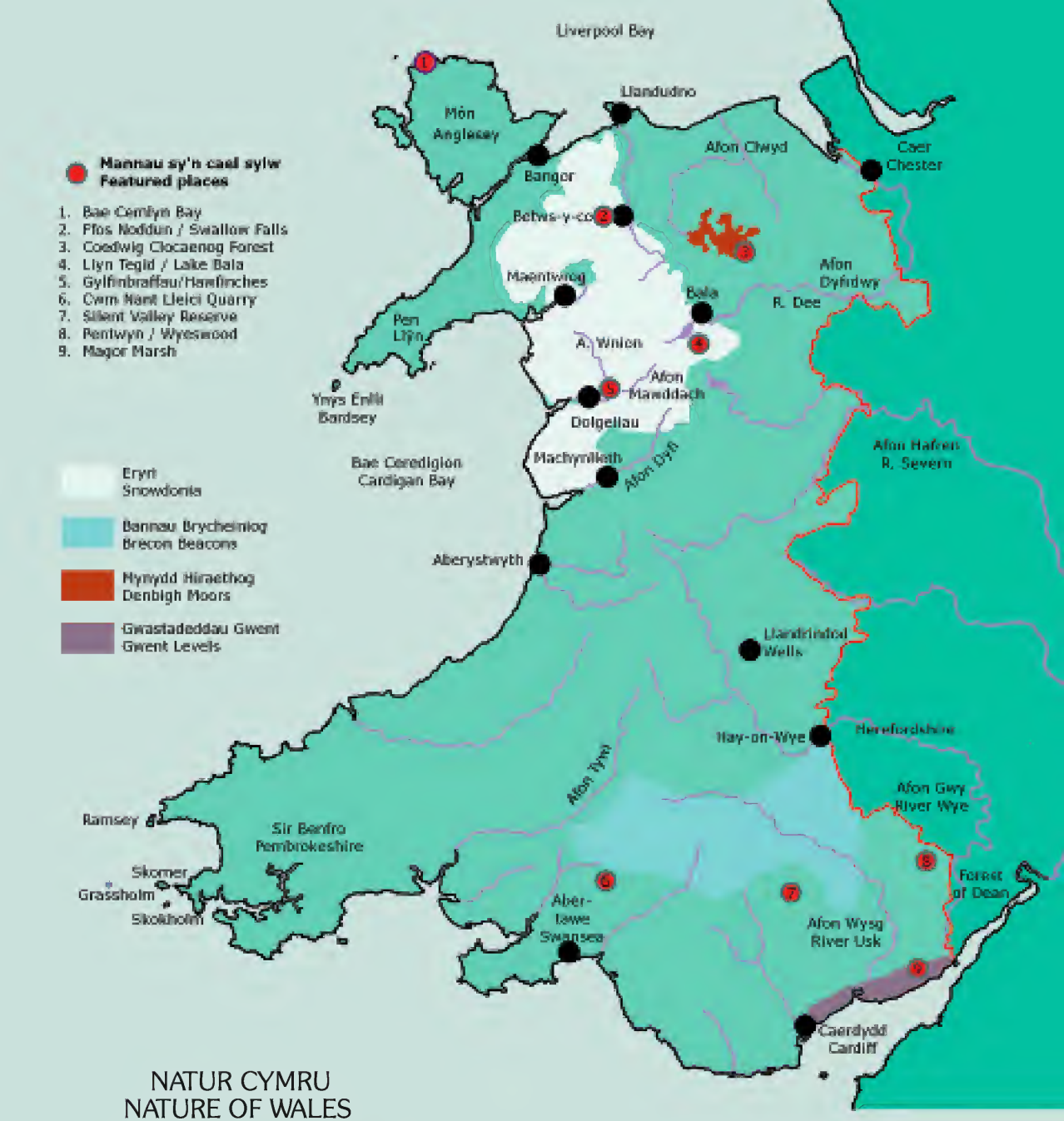
Rory Francis *is Communications Officer for the Woodland Trust (Coed Cadw).*

Rory Francis

Ffos Noddun / Fairy Glen, Betws-y-Coed

Ben Hall (rspb-images.com)

Gwalch glas
Accipiter nisus
Sparrowhawk



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